I-405
CORRIDOR PROGRAM NEPA/SEPA DRAFT EIS

DRAFT SURFACE WATER RESOURCES EXPERTISE REPORT

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SUMMARY

The I-405 Program Project Area covers the east side of Lake Washington and areas to the north and south of the lake. There are two major lakes (Washington and Sammamish) and 20 major stream basins in the 134,000-acre project area. Rivers included in the project area include the Sammamish River, the lower Green/Duwamish River, and the lower Cedar River. Current impervious coverage due to development in these stream basins ranges from 17 to 55 percent, averaging 36 percent. As a result of the relatively high degree of urbanization in the basins, most of the streams have experienced flooding problems and/or channel destabilization. Virtually all of the streams and lakes fail to meet water quality standards during at least a portion of the year. The most common water quality problems are fecal coliforms, with less frequent violations of temperature and dissolved oxygen.

The I-405 Program consists of more than 200 individual arterial, highway, transit, and bike/pedestrian trail projects. The amount of new impervious area associated with the projects in the No Action Alternative would be 164 acres. Additional impervious area would range from 305 acres under Alternative 1 to 888 acres under Alternative 4. Compared to the No Action Alternative, pollutant loads from I-405 would be reduced very slightly under Alternative 1 while increasing substantially under the remaining three alternatives. For instance, suspended solids are calculated to decline by 2 tons/year under Alternative 1 but increase up to 365 tons per year under Alternative 4.

In terms of overall impact to surface water resources, the alternatives fall into three groupings. The No Action Alternative and Alternative 1 would have the least impact. They would have the lowest amounts of new impervious surface and would not have any long-term substantial impacts to any of the basins. Although Alternative 3 would result in a similar amount of impervious area as Alternative 2, it would potentially impact just one basin. Alternatives 2 and 4 would generate the highest levels of impervious surface and could potentially impact three and six basins, respectively.

Mitigations will be implemented to reduce project impact upon the surface waters in the project area. However, on-site mitigations will not adequately address all impacts for all basins (see previous paragraph). Basin- and WRIA-level mitigations are recommended to address base flow, stream habitat, and (in the case of Springbrook Creek) potential water quality impact. With the implementation of both on-site and basin-level mitigations, project surface water impacts of the I-405 Program can be controlled to non-substantial levels. The following table summarizes the potentially substantial surface water impacts.

Summary of Surface Water Resource Impacts

Impact	No Action	Alt. 1[a]	Alt. 2[a]	Alt. 3[a]	Alt. 4[a]
Acres of Impervious Area	123	305	646	600	888
# Basins – Construction Impacts	1	6	11	10	9
# Basins – Base Flow Impacts	0	0	3	1	6
# Basins – Water Quality Impacts	0	0	1	0	1

[a] These impacts are in addition to the impacts under the No Action Alternative.

1 INTRODUCTION

1.1 Report Organization and Scope

This report characterizes the surface water impacts that potentially could be caused by implementation of any of the five alternatives that are being studied for improving transportation within the I-405 corridor.

The report is divided into six general sections, followed by references and seven appendixes. The six sections are:

Section 1 – provides a basic understanding of the purpose and scope of the study and the area under consideration.

Section 2 – gives a brief description of each of the four action alternatives and one No-Action alternative being evaluated.

Section 3 - describes the methodology used for the surface water impact analysis, explains the significance criteria used in this report, and discusses the general stormwater and ESA regulatory requirements affecting the program.

Section 4 - describes the general conditions in the 20 individual basins within the project area. This section also discusses water quality and the state standards set for the streams. Stormwater management issues common to the project area are also reviewed.

Section 5 – discusses the potential project impacts within the stream basins under each alternative. Both construction and long-term operational impacts are examined. Pollutant loads are calculated for each of the nine I-405 segments. Mitigations are identified for those basins that may experience substantial surface water impacts.

Section 6 – compares surface water impacts among the alternatives. Both basin-specific and river basin-wide mitigations are discussed.

1.2 Overview of I-405 Corridor Program

Construction of the 30-mile Interstate 405 (I-405) freeway in the early 1960s as a bypass around Seattle for Interstate 5 (I-5) traffic also opened the rural, agricultural countryside east of Lake Washington to commercial and residential development. Interstate 405 currently ranges from six to ten lanes along the 30-mile corridor, and it is the designated military route through Seattle, as Interstate 5 was deemed too constricted (see Figure 1.1). Construction of the Evergreen Point (SR 520) floating bridge in 1963 further set the stage for rapid and substantial changes on the Eastside.

Today, I-405 has changed dramatically from a Seattle bypass to become the region's dominant north-south travel corridor east of I-5. More than two-thirds of the total trips on I-405 begin and end in the corridor itself. The remaining third have strong ties with the communities along SR 167 to the south of the study area, and with developing areas to the east within the urban growth area

of King County. However, as the regional importance of the I-405 corridor has grown, it has become increasingly evident that worsening traffic congestion within the corridor has the potential to create serious adverse effects on personal and freight mobility, the environment, the state and regional economy, and the quality of life.

In response to these and other concerns, the Washington State Department of Transportation (WSDOT) has joined with the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), Central Puget Sound Regional Transit Authority (Sound Transit), King County, and local governments to develop strategies to reduce traffic congestion and improve mobility in the I-405 corridor from Tukwila in the south to Lynnwood in the north.

The I-405 Corridor Program is a cooperative effort involving over 30 agencies that have responsibilities for planning, regulating, and implementing transportation improvements in the 250+ square-mile corridor. The decision to be made through this combined National Environmental Policy Act / State Environmental Policy Act EIS is to identify the best mix of modal solutions, transportation investments, and demand management to improve movement of people and goods throughout the I-405 corridor, reduce foreseeable traffic congestion, and satisfy the overall program purpose and need.

The programmatic I-405 Corridor Program EIS focuses on broad corridor-wide issues related to travel mode and transportation system performance. This is consistent with the program objective to enable program decisions focusing on mode choice, corridor selection, general location of improvements, and how combinations of improvements may function together as a system to solve corridor-wide transportation problems. A programmatic level of analysis is appropriate and necessary at this early stage in the decision-making process, when many project-level design details would not be meaningful in evaluating effects on mobility and environmental quality across such a large area. Subsequent environmental analysis, documentation, and review will be prepared to enable decisions regarding site-specific, project-level details on alignments, high-capacity transit technology, project impacts, costs, and mitigation measures after a preferred alternative has been identified.

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1.3 Need For the Proposed Action

The need identified for the I-405 Corridor Program is:

> To improve personal and freight mobility and reduce foreseeable traffic congestion in the corridor that encompasses the I-405 study area from Tukwila to Lynnwood in a manner that is safe, reliable, and cost-effective.

The following sub-sections expand upon the issues and trends that influence the need for the proposed action, particularly with respect to travel demand and traffic congestion, and the attendant effects on freight mobility and safety.

1.3.1 Growth in Travel Demand

Between 1970 and 1990, communities in the I-405 corridor grew much faster than the central Puget Sound region as a whole. During the 20-year period, employment in the study area increased

Legend: Study Area

- Study Area Boundary
- Urban Growth Area
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Note: All projects contained in the No Action Alternative (not indicated in Figure) would be implemented as part of each action alternative.

SNOHOMISH

KING

Mill Creek
Lynnwood
Edmonds
Woodway
Mountlake Terrace
Brier
Bothell
Kenmore
Woodinville
Shoreline
Lake Forest Park
Simonds Rd NE
Duvall
NE 128th St
Kirkland
Redmond
Lake Washington
Union Bay
Lake Union
Hunts Point
Yarrow Point
Clyde Hill
Medina
NE 8th St
Bellevue
148th Ave SE
Redmond Fall City Rd
Lake Sammamish
Seattle
Beaux Arts
Mercer Island
Sammamish
Duwamish River
Newcastle
Coal Creek Pky SE
Issaquah
Tukwila
SE 128th St
Renton
Burien
Normandy Park
SeaTac
SE Petrovitsky Rd
68th Ave
Kent
132nd Ave SE
Des Moines
Covington
Auburn
Federal Way
Everett
Seattle
Tacoma

5 90 405 527 524 522 202 99 520 509 900 167 515 169 203 18 516

Study Area

Figure No. 1.1

over 240 percent from 94,500 to 323,175 and population grew nearly 80 percent from 285,800 to 508,560.

Population and employment continued to grow during the 1990s; in particular, employment grew at an annual rate of almost 3.5 percent. Looking ahead, growth in the corridor through 2020 likely would keep pace with the robust rate of growth in the Puget Sound region. The I-405 corridor population and employment is forecast to increase by more than 35 percent. This means that by 2020 an additional 144,000 people are expected to be employed within the study area, while the population is expected to reach approximately 765,000, an increase of more than 200,000 people from 1997.

1.3.1.1 Travel Demand

Travel demand trends in the I-405 corridor match these population and employment trends: between 1995 and 2020, person trips are generally expected to increase more than 50 percent. Travel demand in terms of traffic volume is heaviest within the study area on I-405 itself, with the freeway carrying 60 to 70 percent of the total daily traffic volumes passing though the study area in the north-south direction. Conversely, the arterial streets carried 30 to 40 percent. In the east-west direction, the arterial street system plays an important role, with volumes almost equally distributed between the arterial streets and the two east-west freeways, I-90 and SR 520. In 1999, the highest volumes on I-405 occurred in the vicinity of NE 8th Street in Bellevue: about 210,000 vehicles per day. I-405 at SR 900 in Renton typified traffic volumes on I-405 south of I-90, carrying about 138,000 vehicles per day.

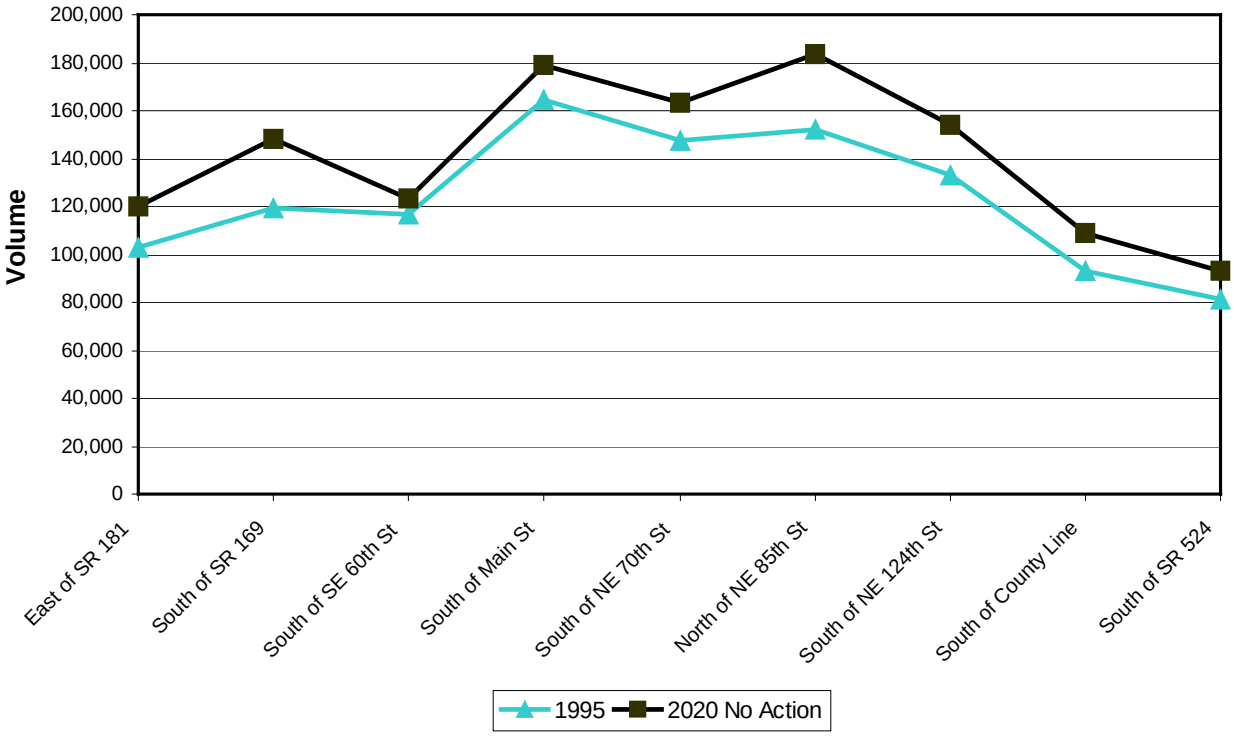
WSDOT's most recent traffic count data (1999) show the lowest I-405 traffic volumes, 95,000 vehicles per day, in the north end between SR 522 and I-5 at Swamp Creek, and the highest, 210,000 vehicles per day, between I-90 and SR 520. The section south of Kirkland to SR 520 carries 185,000 to 195,000 vehicles per day, and the section south of I-90 typically carries 150,000 vehicles per day. Figure 1.2 shows these findings. This variation in traffic volumes is the result of different travel demands within the corridor as well as the available capacity on the freeway.

1.3.1.2 Mode Split

Single-occupant vehicles (SOVs) generate the majority of traffic demand: up to 78 percent of work trips within the I-405 study area are SOVs. High-occupancy vehicles (HOVs) and transit users comprise around 20 percent of all work trips within the study area. SOV use in the study area is higher than the average for King County, while HOV and walk/bike percentages are lower. These results reflect the more suburban character of the I-405 study area.

The segment of I-405 with the highest peak-period transit ridership is between SR 520 and the Totem Lake area (2,100 riders). Transit ridership near each of the northern and southern termini of I-405 is less than 1,000 riders during peak periods. To encourage more transit demand, Sound Transit's Regional Express program is currently in the planning and early design stages of new park-and-ride lots, transit centers, and direct access ramps, including large-scale improvements to several I-405 interchanges. King County Metro and Sound Transit's evolving bus transit services concept for the I-405 study area would serve multiple activity centers, instead of the traditional Seattle/Bellevue hub-and-spoke design.

Figure 1.2: Daily Traffic Volumes at Selected Locations on I-405



Source: PSRC Model

1.3.1.3 Trip Characteristics

Travel demand on I-405 appears greater for longer trips; along several sections of I-405, the average vehicle trip length exceeds 25 miles, roughly three times the study area average. Forecasts for 2020 show the freeway attracting even more long trips, with over 50 percent of all trips on I-405 exceeding 30 miles in length.

Today in the study area, only 20 percent of the total daily person-trips are home-based work trips, that is, commute trips directly to and from work. Thirty-nine percent of daily person-trips are other home-based trips (e.g., shopping, recreational, personal business) and 28 percent are non-home-based trips (e.g., traveling from work to daycare or shopping). School (2 percent) and commercial vehicle trips (11 percent) make up the rest. The relative shares of each trip purpose are expected to be similar in 2020. The fairly small share of trips that are purely to and from work reflects the fact that people are increasingly linking their trips, stopping on the way home to shop, pick up children, etc. (which are considered non-home based trips). This poses a challenge for transit and carpool/vanpool use.

1.3.2 Traffic Congestion and Reliability

1.3.2.1 Traffic Congestion

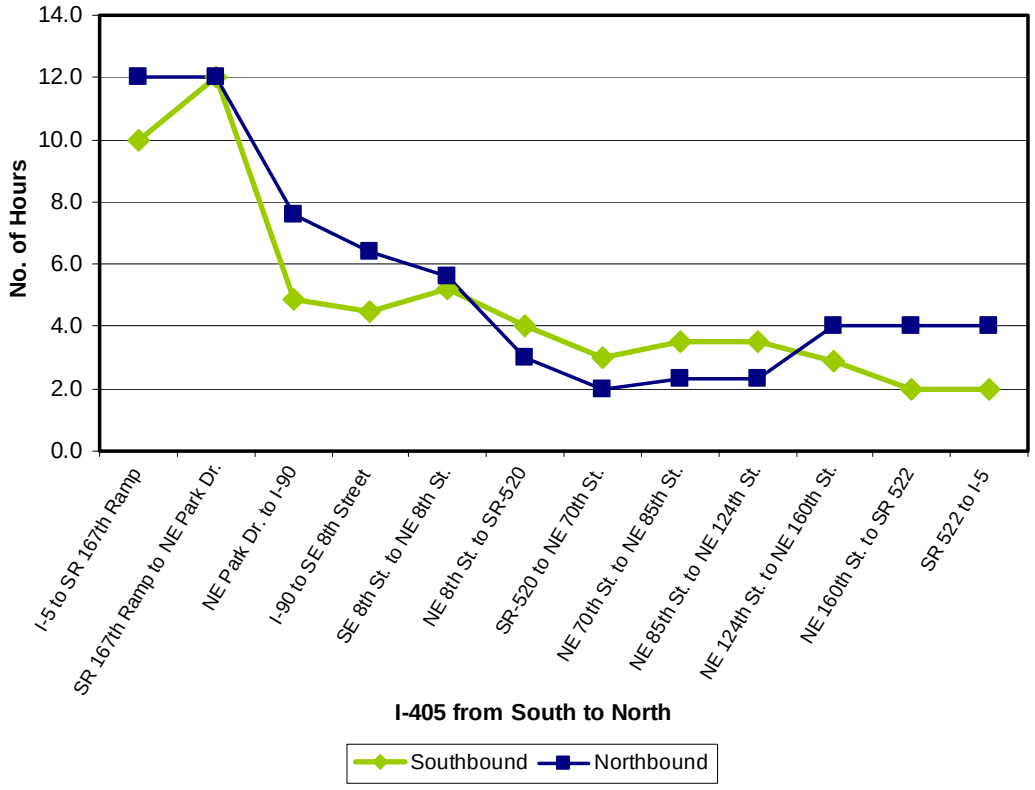
Heavy travel demand and frequent traffic incidents contribute to substantial traffic congestion on I-405, although they are not the only causes. Traffic congestion along I-405 is widespread during the morning and afternoon peak periods and has spread to surrounding time periods. A useful

way to examine daily congestion is to look at the number of hours during which a facility is congested. For purposes of this analysis, "congestion" on the freeway is defined as travel speeds below 45 mph. Figure 1.3 illustrates the severity of traffic congestion that was present in 1997 at twelve points along I-405. The duration of traffic congestion in the northbound and southbound directions is roughly the same. The most congested area of I-405 is from I-5 in Tukwila to NE Park Drive in the city of Renton. Traffic congestion for 10-12 hours per day is typical in this section. For most other sections, traffic congestion lasts 2 to 7 hours per day.

The average daily "volume per freeway lane" is quite consistent throughout the corridor, which demonstrates that traffic volumes alone do not cause congestion. The most likely reason for the high hours of congestion in the south end of I-405 relates to freeway "friction" caused by curves (e.g., the "S-Curves"), grades (e.g., Kennydale Hill), and complex interchanges at I-5 and SR 167.

Traffic congestion on I-405 often results in blockage of mainline flows throughout the day by vehicles that cannot get onto the ramps at such locations as SR 167, I-90, SR 520, and SR 522. The spill-over traffic from the ramps has created substantial mainline traffic congestion and operational hazards throughout the I-405 corridor. This congestion also causes traffic to back up onto local arterials.

Figure 1.3: Hours of Traffic Congestion on I-405



Source: PSRC Model, Mirai Associates

1.3.2.2 Travel Time

Variation in congestion causes travel times to vary widely within the I-405 study area, depending upon the origin and destination of the trip and the mode of travel being used. Table 1.1

summarizes typical P.M. peak-hour travel times (1995 data) for a variety of study area trips, averaging 23 miles in length. The times are for door-to-door travel, including in-vehicle time and access to the trip's origin and destination. The fastest trips are typically by non-transit HOV mode, particularly for longer trips along I-405 that can take full advantage of the HOV lane system. Traveling along the full length of I-405 during the peak period can take longer than one hour for general traffic. Transit travel times are often at least twice as long as driving the equivalent distance, especially for people walking to the transit stops. Transit travel times are 10 to 15 percent faster for park-and-ride access trips compared with walk access transit trips. This is partially due to shorter wait times at park-and-ride locations created by more frequent transit service.

Table 1.1: Comparison of Typical I-405 Study Area P.M. Peak Hour Travel Times by Mode

Trip	Distance (miles)	General Traffic Travel Time (min)	HOV Travel Time (min)	Transit Travel Time Walk Access (min)	Transit Travel Time Park-and-Ride Access (min)
Bellevue Central Business District (CBD) to Federal Way/Kent	25	56	40	95	83
Renton to Mill Creek	33	65	49	125	105
Bellevue CBD to Edmonds/Lynnwood	19	42	38	85	76
Tukwila/SeaTac to Redmond/Overlake	23	49	39	116	103
Issaquah/Cougar Mt. to Bothell/Kenmore	23	46	39	108	98
Issaquah/Cougar Mt. to Federal Way/Kent	23	56	47	132	118

Source: Puget Sound Regional Council (PSRC) Model - 1995 base year

1.3.2.3 Travel Time Reliability

Not only do travel times vary by segment within the I-405 study area, they are unpredictable from day to day. The reliability of travel times can be defined in terms of deviation from a mean travel time when travelers in the same transportation mode repeat their trips with identical travel routes starting at a same time of day. A transportation system provides a good level of service when travelers experience the same travel time every time or with little deviation.

The Washington State Transportation Center (TRAC) conducted research to measure the performance of the freeway system in the Central Puget Sound area, which includes the travel time reliability measure for general traffic along I-405. The most recent analysis results are described in the report entitled Central Puget Sound Freeway Network Usage and Performance, 1999 Update, Volume 1 (Washington State Transportation Center and Washington State Department of Transportation). The following summarizes the findings of the travel time reliability data prepared by the TRAC for 1999.

- Existing travel time reliability for the vehicles traveling *from Tukwila to Bellevue CBD* is very poor during the mid-day and evening periods and extremely poor during the morning peak period.
- Existing travel time reliability for the vehicles traveling *from Bellevue CBD to Tukwila* is poor throughout the day (from 6:00 A.M. to 6:30 P.M.). In particular, the travel time reliability during the afternoon peak period is very poor and the traffic flows in the period are highly unstable.

- Existing travel time reliability for the trips *from Bellevue CBD to SR 522* is relatively poor during the P.M. peak period. Travelers starting trips during other periods have experienced good travel time reliability.
- Existing travel time reliability problems for the trips *from SR 522 to Bellevue CBD* are confined to the A.M. peak period. The problem is worst at 8 A.M.

Traffic incidents along the freeway corridor are major causes of the reliability problems. The State's Incident Management Program was implemented to help improve overall travel time reliability within the I-405 Corridor. Reliability of travel in the HOV lanes is considerably better than in the general purpose lanes. HOV travel times typically operate from 15-20 miles per hour faster than the adjacent general purpose lanes during congested time periods. HOV travel time reliability suffers when there is a major incident along I-405 with stop-and-go conditions. In these situations, HOV speeds drop and the level of HOV lane violations tends to increase.

1.3.3 Freight Mobility

The decreasing reliability of the regional transportation system, including I-405, is creating a serious problem for regional freight mobility. The central Puget Sound region serves as an important freight gateway to Pacific Rim countries. Automobiles, forest and agricultural products, communications and computer equipment, and hundreds of other items continuously move over the region's roadways and railroads, to seaports and airports. Substantial delay as a result of transportation system congestion is costing the region's businesses nearly $700 million a year, according to information from WSDOT. The cost to the freight industry itself is estimated to be around $200 million per year.

Products shipped by truck across I-90 from Eastern Washington reach points north and south of Seattle via I-405. At the same time, I-405 serves as a heavily used transport corridor for local freight delivery to and from the cities along the corridor. Smaller trucks, such as delivery vans, account for many freight trips within the region, and these trips could benefit greatly from roadway improvements to I-405.

Interstate 405 continues to be used by freight carriers as an alternative to the preferred I-5 route when severe congestion occurs on I-5 in downtown Seattle near the Convention Center (one of the most substantial freight mobility bottlenecks in the region). I-405 also provides ready access to the distribution centers along SR 167 in the Kent Valley. Volumes of heavy trucks on the portion of I-405 south of I-90 are about double those along the northern portion due to truck movements to and from the Kent Valley. Truckers identify congestion at the SR 167/I-405 interchange as one of the worst transportation system problems in the region, and the trucking community supports improvements to this major truck corridor interchange as one of its top priorities.

The latest data indicate that the central Puget Sound region's roadways carry approximately 1.2 million truck trips each day, with about 70 percent of those trips occurring within King County. I-405 carries a substantial portion of those trips, moving up to 90 percent of the total truck origins and destinations in east King County. Truck volumes along I-405 are expected to grow by 50 percent by the year 2010. Reductions in system reliability and resulting higher transportation costs increase the cost of manufacturing and distributing goods, while adversely affecting economic vitality and job creation. Accessibility to markets becomes increasingly difficult with worsening traffic congestion and delay. Improvements to the I-405 corridor could provide tangible economic benefits for all of Washington State.

1.3.4 Safety

Twenty-nine of the 280 high accident locations in King and Snohomish counties are located along I-405. Most high accident locations are associated with ramps connecting to I-405, including those at SR 181 (Interurban), SR 169, SR 900 (Sunset and Park), Coal Creek Parkway, SE 8th Street, NE 4th Street, NE 8th Street, SR 908 (NE 85th Street), NE 116th Street, NE 160th Street, and SR 527. The portion of I-405 north of SR 527 is identified as a high accident corridor due to the relatively higher speeds and more serious injuries associated with these accidents.

Over the three-year period from 1994 to 1996, a total of 5,580 accidents was reported along I-405. Most collisions occurred on the mainline freeway, with about one-fourth of all accidents occurring on the ramps, collector-distributor roads, and cross streets at the interchanges. About half of all collisions involve property damage only, while half involve injuries or fatalities. This injury pattern applies equally to the mainline and ramp segments; however, all seven fatalities reported in this period occurred on the I-405 mainline.

The overall accident rate along I-405 (1.6 accidents per million vehicle miles) is about midrange compared to other freeways in King County. The rates are lower than the average rate for all state highways (1.88 accidents per million vehicle miles, or MVM) and for state highways in King County (2.27 accidents per MVM). On comparable local freeways, I-5 and SR 520 both exhibit accident rates of about 2.0 accidents per MVM. WSDOT's ramp metering program on I-405 has been very successful. Rear-end and sideswipe accidents have decreased by 60 percent to 70 percent near locations with ramp meters.

For state roads serving as surface arterial routes, accident rates typically fall into the range of three to five accidents per MVM. This rate is related to the presence of traffic signals, driveways, pedestrians, and bicyclists, and lower levels of access control. These accident rates are typical of urban arterial facilities. Accident rates for selected arterial and collector routes in the primary study area generally range between two and four accidents per MVM, with some streets higher. These streets also experience higher accident rates due to the presence of signalized intersections, driveways, and other conflicts.

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1.4 Purpose of the Proposed Action

The purpose of the proposed action is:

> To provide an efficient, integrated, and multi-modal system of transportation solutions within the corridor that meets the need in a manner that:
>
> - ➢ Provides for maintenance or enhancement of livability for communities within the corridor;
> - ➢ Provides for maintenance or improvement of air quality, protection or enhancement of fish-bearing streams, and regional environmental values such as continued integrity of the natural environment;
> - ➢ Supports a vigorous state and regional economy by responding to existing and future travel needs; and
> - ➢ Accommodates planned regional growth.

1.5 Study Area

The study area for the I-405 Corridor Program defines the general boundaries of the I-405 corridor and encompasses the essential improvements proposed within each alternative. It encompasses an area of approximately 250 square miles that extends on both sides of I-405 between its southern intersection with I-5 in the city of Tukwila and its northern intersection with I-5 in Snohomish County. This area includes the cities of Tukwila, Renton, Newcastle, Bellevue, Redmond, Kirkland, Woodinville, and Bothell, as well as portions of the cities of Issaquah, Kenmore, Kent, Lynnwood, and Mercer Island and adjacent unincorporated areas of King and Snohomish counties.

For purposes of environmental analysis, documentation, and review, potential substantial adverse effects are identified and evaluated wherever they are reasonably likely to occur in the region.

2 DESCRIPTION OF ALTERNATIVES

Four programmatic action alternatives and a No Action Alternative are evaluated in this Environmental Impact Statement (EIS). Each of the four action alternatives is a combination of multi-modal transportation improvements and other mobility solutions packaged to work together as a system. Each package demonstrates a unique emphasis in response to the purpose and need for the I-405 Corridor Program. The improvements and mobility solutions that comprise each action alternative are assembled from the following major elements:

- Transportation demand management (TDM)
- Regional transportation pricing
- Local transit service (bus and other technologies)
- Bus rapid transit (BRT) operating in improved-access high-occupancy vehicle lanes on I-405, I-90, and SR 520
- Fixed-guideway high-capacity transit (HCT) operating with physical separation from other transporation modes
- Arterial high-occupancy vehicle (HOV) and bus transit priority improvements
- HOV express lanes on I-405 and HOV direct access ramps
- Park-and-ride capacity expansions
- Transit center capacity improvements
- Basic I-405 safety and operational improvements
- I-405 general purpose lanes
- I-405 collector-distributor lanes
- I-405 express lanes
- SR 167 general purpose lanes
- Capacity improvements on freeways connecting to I-405
- Planned arterial improvements
- Capacity improvements on north-south arterials
- Arterial connections to I-405
- Pedestrian and bicycle improvements
- Intelligent transportation system (ITS) improvements
- Truck freight traffic enhancements

These elements are described in greater detail in Appendix A (I-405 Corridor Program - Major Elements of Alternatives). Typical cross-sections for the proposed I-405 lane additions are shown in Appendix E (Roadway Sections). Table 2.1 shows the system elements contained in each of the alternatives.

Table 2.1: System Elements Contained in Each Alternative

	No Action Alternative	Alternative 1 HCT/TDM Emphasis	Alternative 2 Mixed Mode with HCT/Transit Emphasis	Alternative 3 Mixed Mode Emphasis	Alternative 4 General Capacity Emphasis
Committed and funded freeway projects	X	X	X	X	X
Committed and funded HOV projects	X	X	X	X	X
Committed and funded arterial projects	X	X	X	X	X
Park–and-ride expansions included in No Action	X	X	X	X	X
Transit center improvements included in No Action	X	X	X	X	X
Transportation Demand Management (TDM)	X	X	X	X	X
Expanded TDM regional congestion pricing strategies		X			
Expand transit service by 100% compared to K. Co. 6-year plan		X	X	X	
Expand transit service by 50% compared to K. Co. 6-year plan					X
Physically separated, fixed-guideway HCT system		X	X		
Bus rapid transit operating in improved access HOV lanes				X	
Arterial HOV priority for transit		X	X	X	
HOV direct access ramps on I-405			X	X	X
Additional park-and-ride capacity expansion		X	X	X	
Additional transit center improvements		X	X	X	
Basic I-405 safety and operational improvements		X	X	X	X
I-405/ SR 167 interchange ramps for all major movements			X	X	X

Table 2.1: (continued) System Elements Contained in Each Alternative

	No Action Alternative	Alternative 1 HCT/TDM Emphasis	Alternative 2 Mixed Mode with HCT/Transit Emphasis	Alternative 3 Mixed Mode Emphasis	Alternative 4 General Capacity Emphasis
One added general purpose lane in each direction on I-405			X		X
Two added general purpose lanes in each direction on I-405				X	
Two express lanes added in each direction on I-405 [a]					X
Widen SR 167 by one lane each direction to study area boundary			X	X	X
Improved capacity of freeways connecting to I-405			X	X	X
Planned arterial improvements			X	X	X
Complete missing segments of major arterial connecting routes [b]				X	
Expand capacity on north-south arterials [b]					X
Upgrade arterial connections to I-405 [b]			X	X	X
Pedestrian / bicycle connections and crossings of I-405		X	X	X	X
Intelligent transportation system (ITS) improvements		X	X	X	X
Truck freight traffic enhancements		X	X	X	

[a] To be studied as general purpose lanes and as managed high-occupancy/toll (HOT) lanes.
[b] With jurisdictional approval.

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2.1 No Action Alternative

The No Action Alternative includes the funded highway and transit capital improvement projects of cities, counties, Sound Transit, and WSDOT. These projects are already in the pipeline for implementation within the next six years, and are assumed to occur regardless of the outcome of the I-405 Corridor Program. For this reason, they are referred to collectively as the No Action Alternative.

Under the No Action Alternative, only limited expansion of state highways would occur. No expansion of I-405 is included; however, a new southbound I-405 to southbound SR 167 ramp modification would be constructed. Approximately 15 arterial widening and interchange improvement projects would be implemented within the study area by local agencies. Short-term

minor construction necessary for continued operation of the existing transportation facilities would be accomplished, and minor safety improvements would be constructed as required.

It is assumed that Phase I of Sound Transit's regional transit plan would be completed. Approximately 36 HOV direct access projects, arterial HOV improvements, park-and-ride expansions, and transit center enhancements would be implemented in the study area as part of the No Action Alternative. Bus transit service levels by the 2020 horizon year are based upon the Puget Sound Regional Council (PSRC) Metropolitan Transportation Plan. A 20 percent increase in bus transit service hours above the current King County 6-year plan level is assumed by year 2020. Parking costs are expected to increase due to market forces. Additional urban centers and major employment centers within the study area are also assumed to implement parking charges by 2020.

These baseline transportation improvement projects are, or will be, the subject of separate and independent project-specific environmental analysis, documentation, and review. Their direct impacts are not specifically evaluated by the I-405 Corridor Program. However, the secondary and cumulative impacts of these projects are addressed as part of the analyses contained herein.

Figure 2.1 shows the locations of the improvements contained in the No Action Alternative. Appendix B (I-405 Corridor Program EIS Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative.

■

2.2 Alternative 1: High-Capacity Transit/TDM Emphasis

This alternative attempts to minimize addition of new impervious surface from general purpose transportation improvements and to encourage transit use within the study area. To do this, Alternative 1 emphasizes reliance on a new physically separated fixed-guideway HCT system, substantial expansion of local bus transit service, non-construction mobility solutions such as regional transportation pricing, and transportation demand management (TDM) strategies. It does not include any increase in roadway capacity beyond the No Action Alternative. All improvements contained in the No Action Alternative are included in Alternative 1, as well as in the other action alternatives. Table 2.1 shows the system elements contained in each of the alternatives.

Alternative 1 includes a physically separated, fixed-guideway HCT system, potentially using some form of rail technology and potentially operating within portions of the existing Burlington Northern Santa Fe (BNSF) right-of-way. The HCT system would serve the major activity centers within the study area, and would include connections to Redmond and Issaquah and west across Lake Washington to Seattle. The connection across Lake Washington is being evaluated as part of the ongoing Trans-Lake Washington Project EIS. Bus transit service would be doubled compared to the current King County 6-year plan. (The effects of recent transit reductions on short-term transit service have not been assumed.) Arterial HOV priority for transit, additional park-and-ride capacity, and additional transit center improvements also would be provided.

Legend: No Action Alternative Projects

- Transit
- HOV
- Freeways
- Arterials
- Non-motorized
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Note: All projects contained in the No Action Alternative would be implemented as part of each action alternative.

SNOHOMISH

KING

Mill Creek
Lynnwood
Edmonds
Mountlake Terrace
Woodway
Brier
Bothell
Kenmore
Woodinville
Shoreline
Lake Forest Park
Simonds Rd NE
Duvall
NE 128th St
Kirkland
Redmond
Lake Washington
Union Bay
Lake Union
Narrow Point
Hunts Point
Clyde Hill
Medina
NE 8th St
Bellevue
Lake Sammamish
Redmond Fall City Rd
Seattle
Beaux Arts
148th Ave SE
Sammamish
Mercer Island
Duwamish River
Coal Creek Pky SE
Newcastle
Issaquah
Tukwila
SE 128th St
Renton
Burien
Normandy Park
SeaTac
SE Petrovitsky Rd
68th Ave
132nd Ave SE
Kent
Des Moines
Maple Valley
Covington
Auburn
Federal Way

5 90 405 527 524 522 202 520 99 509 900 167 515 169 203 18 516

No Action Alternative

Figure No. 2.1

A package of basic improvements to I-405 would be implemented, including climbing lanes, auxiliary lanes, I-90/Coal Creek interchange improvements, and I-405/SR 167 interchange improvements, among others. No additional general purpose lanes on I-405 would be provided.

Limited arterial HOV/transit improvements would be provided to facilitate access to I-405 and the fixed-guideway HCT system, along with non-construction treatments such as providing priority for transit at signals and intersections. Regional pricing strategies similar to those currently being studied by the Puget Sound Regional Council (PSRC) would be implemented along with a package of core TDM strategies that are common to all the action alternatives.

Figure 2.2 shows the location of improvements contained in Alternative 1. Appendix A (I-405 Corridor Program - Major Elements of Alternatives) describes the system elements that are the building blocks for the alternatives. Appendix B (I-405 Corridor Program EIS Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative.

■

2.3 Alternative 2: Mixed Mode with High-Capacity Transit/Transit Emphasis

This alternative attempts to improve mobility options in the study area relative to Alternative 1 by providing the same substantial commitment to transit, combined with the minimum increase in roadway capacity for HOV and general purpose traffic. To do this, Alternative 2 would implement a new physically separated, fixed-guideway HCT system, substantial expansion of local bus transit service, one added lane in each direction on I-405, and improvements to connecting arterials. All improvements contained in the No Action Alternative are included in Alternative 2, as well as in the other action alternatives. Table 2.1 shows the system elements contained in each of the alternatives.

Alternative 2 includes a physically separated, fixed-guideway HCT system, potentially using some form of rail technology. The HCT system would serve the major activity centers within the study area, and would include connections to Redmond and Issaquah and west across Lake Washington to Seattle. The connection across Lake Washington is being evaluated as part of the ongoing Trans-Lake Washington Project EIS. Bus transit service would be doubled compared to the current King County 6-year plan. Arterial HOV priority for transit, additional park-and-ride capacity, and additional transit center improvements are included, as well as completion of the HOV freeway-to-freeway ramps along I-405.

To increase general purpose capacity, I-405 would be widened by one lane in each direction. One lane also would be added in each direction on SR 167 to the study area boundary. The package of basic improvements to I-405 would be implemented, along with the core TDM strategies that are common to all action alternatives. New capacity improvements on connecting arterials and freeways would be provided along with planned arterial improvements of local jurisdictions.

Figure 2.3 shows the location of improvements contained in Alternative 2. Appendix A (I-405 Corridor Program - Major Elements of Alternatives) describes the system elements for the alternatives. Appendix B (I-405 Corridor Program EIS Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative.

2.4 Alternative 3: Mixed Mode Emphasis

This alternative attempts to substantially improve mobility options for all travel modes and to provide a HCT system throughout the study area at a lower cost than the physically separated, fixed-guideway system proposed in Alternatives 1 and 2. To do this, Alternative 3 would implement a new bus rapid transit (BRT) system, substantial expansion of local bus transit service, two added lanes in each direction on I-405, and improvements to arterials within the study area. All improvements contained in the No Action Alternative are included in Alternative 3, as well as in the other action alternatives. Table 2.1 shows the system elements contained in each of the alternatives.

Alternative 3 includes a BRT system operating in improved-access HOV lanes on I-405, I-90, and SR 520. The BRT system would serve the major activity centers within the study area, and would include connections to Redmond and Issaquah and west across Lake Washington to Seattle. The connection across Lake Washington is being evaluated as part of the ongoing Trans-Lake Washington Project EIS. Bus transit service would be doubled compared to the current King County 6-year plan. Improved arterial HOV priority for transit, park-and-ride capacity, transit center improvements, and HOV direct access are included, as well as completion of the HOV freeway-to-freeway ramps along I-405.

This alternative would substantially increase capacity for general purpose traffic on I-405 by adding two lanes in each direction and improving major interchanges. These added general purpose lanes replace most of the auxiliary and climbing lanes contained in the package of basic improvements to I-405 that are common to the other action alternatives. One lane would be added in each direction on SR 167 to the study area boundary. The core TDM strategies would be implemented. New capacity improvements on connecting arterials and freeways would be provided. Selected arterial missing links would be completed together with planned arterial improvements of local jurisdictions.

Figure 2.4 shows the location of improvements contained in Alternative 3. Appendix A (I-405 Corridor Program - Major Elements of Alternatives) describes the system elements for the alternatives. Appendix B (I-405 Corridor Program EIS Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative. Appendix E (Roadway Sections) shows typical cross-sections for the proposed I-405 lane additions.

2.5 Alternative 4: General Capacity Emphasis

This alternative places the greatest emphasis on increasing general purpose and HOV roadway capacity, with substantially less reliance on new transit facilities or added local bus service than any of the other action alternatives. To do this, Alternative 4 would provide one additional lane in each direction on I-405, a new four-lane I-405 express roadway, and the other general purpose and HOV roadway improvements on I-405 and connecting freeways contained in Alternative 3. The expansion of local bus transit service would be about half that proposed under the other action alternatives. All improvements contained in the No Action Alternative are included in Alternative 4, as well as in the other action alternatives. Table 2.1 shows the system elements contained in each of the alternatives.

Legend: Alternative 1: High Capacity Transit/ Transportation Demand Management (TDM) Emphasis

- Transit
- HOV
- Freeways
- Arterials
- Non-motorized
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Note: All projects contained in the No Action Alternative (not indicated in Figure) would be implemented as part of each action alternative.

SNOHOMISH

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Mill Creek
Lynnwood
Edmonds
Woodway
Mountlake Terrace
Brier
Bothell
Kenmore
Woodinville
Shoreline
Lake Forest Park
Simonds Rd NE
Duvall
NE 128th St
Kirkland
Redmond
Lake Washington
Union Bay
Lake Union
Narrow Point
Hunts Point
Clyde Hill
Medina
NE 8th St
Bellevue
Lake Sammamish
Redmond Fall City Rd
Seattle
Beaux Arts
148th Ave SE
Sammamish
Mercer Island
Duwamish River
Coal Creek Pky SE
Newcastle
Issaquah
Tukwila
SE 128th St
Renton
Burien
Normandy Park
SeaTac
SE Petrovitsky Rd
68th Ave
132nd Ave SE
Kent
Des Moines
Maple Valley
Covington
Auburn
Federal Way

5 90 527 524 522 202 405 99 520 203 509 900 169 167 515 18 516

Alternative 1: High Capacity Transit/ Transportation Demand Management (TDM) Emphasis

Figure No. 2.2

Legend: Alternative 2: Mixed Mode with High Capacity Transit Emphasis

- Transit
- HOV
- Freeways
- Arterials
- Non-motorized
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Note: All projects contained in the No Action Alternative (not indicated in Figure) would be implemented as part of each action alternative.

SNOHOMISH

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Kirkland
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Lake Washington
Union Bay
Lake Union
Narrow Point
Hunts Point
Clyde Hill
Medina
NE 8th St
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Tukwila
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Normandy Park
SeaTac
SE Petrovitsky Rd
68th Ave
132nd Ave SE
Kent
Des Moines
Maple Valley
Covington
Auburn
Federal Way

Alternative 2: Mixed Mode with High Capacity Transit Emphasis

Figure No. 2.3

Legend: Alternative 3: Mixed Mode Emphasis

- Transit
- HOV
- Freeways
- Arterials
- Non-motorized
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Note: All projects contained in the No Action Alternative (not indicated in Figure) would be implemented as part of each action alternative.

SNOHOMISH

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Maple Valley
Covington
Auburn
Federal Way

Alternative 3: Mixed Mode Emphasis

Figure No. 2.4

Alternative 4 would expand freeway capacity by adding one additional general purpose lane in each direction on I-405 in most segments, improving major interchanges, and constructing a new four-lane I-405 express roadway consisting of two lanes in each direction with limited access points. Completion of the HOV freeway-to-freeway ramps along I-405 and the package of basic improvements to I-405 would be implemented.

Arterial improvements would include additional expansion of major arterial routes and connections to I-405 in conjunction with the planned arterial improvements of local jurisdictions. Transit in this alternative is assumed to be a continuation of the existing local and express bus transit system with a 50 percent increase in service compared to the current King County 6-year plan. Park-and-ride capacity would be provided along with the core TDM strategies that are common to all action alternatives.

Figure 2.5 shows the location of improvements contained in Alternative 4. Appendix A (I-405 Corridor Program - Major Elements of Alternatives) describes the system elements for the alternatives. Appendix B (I-405 Corridor Program EIS Alternatives Project Matrix) identifies the specific transportation improvements and mobility solutions contained within each system element and alternative. Appendix E (Roadway Sections) shows typical cross-sections for the proposed I-405 lane addition and express roadway.

Legend: Alternative 4: General Capacity Emphasis

- Transit
- HOV
- Freeways
- Arterials
- Non-motorized
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Note: All projects contained in the No Action Alternative (not indicated in Figure) would be implemented as part of each action alternative.

SNOHOMISH

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Kirkland
Redmond
Lake Washington
Union Bay
Lake Union
Yarrow Point
Hunts Point
Clyde Hill
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Burien
Normandy Park
SeaTac
SE Petrovitsky Rd
68th Ave
132nd Ave SE
Kent
Des Moines
Maple Valley
Covington
Auburn
Federal Way

Alternative 4: General Capacity Emphasis

Figure No. 2.5

3 METHODOLOGY AND COORDINATION

This section describes the information gathered and the methods used to evaluate surface water impacts of the I-405 Corridor Program. Note that impacts to floodplains are covered in a separate Floodplains Expertise Report.

■

3.1 Approach to Analyses

Existing rivers, streams, and lakes within the project area, and their associated drainage basins were developed from GIS information made available from King County. Similar GIS data for stream basins in Snohomish County were obtained from that county's GIS Center. The drainage basins' boundaries and stream network were then refined using U.S. Geological Survey (USGS) quadrangle maps of the project area.

Summary flow data for the major streams in the project area were obtained from the National Water Information System of the USGS, available on the World Wide Web. This was supplemented by information in the USGS-published annual reports, *Water Resources Data for Washington*. The Washington Administrative Code (WAC) was reviewed for the current water quality standards for each of the major streams in the project area (Appendix C). The 303d List published by the Washington Department of Ecology (Ecology), available from the Department's Web home page, was used to identify water bodies which do not meet standards. These streams were added to the project GIS database and plotted.

Published state and local stormwater management manuals were reviewed to identify runoff requirements. Ecology's *Draft Stormwater Management Manual for Western Washington*, scheduled for final publication in early 2001, was reviewed. The stormwater management manuals for King and Snohomish Counties were also reviewed. Selected basin plans were reviewed to determine any additional stormwater management requirements that might apply to any of the alternatives. The *Tri-County Proposal for Stormwater Management* was reviewed for policies and regulations likely to emerge under the federal Endangered Species Act (ESA) and its 4(d) Rule conditions. In addition, meetings were conducted with eight agencies to gather information on surface water concerns and policies within the project area (refer to Section 3.2):

A listing of existing stormwater facilities for I-405 and other major state highways in the project area was obtained from WSDOT. Their locations were plotted and are shown in Figure 3.1. Opportunities for retrofit of existing highway stormwater facilities were then generally identified.

Long-term annual pollutant loads along I-405 were estimated using the methods described in the WSDOT *Highway Water Quality Manual* (WSDOT, 1988). Those methods rely on predictions of average daily traffic, determinations of highway length, and change in impervious surfaces, using relationships established by long-term highway runoff studies in Washington. Pollutant loadings for total suspended solids and other selected pollutants were calculated for the nine individual segments of I-405. The loading calculations are shown in Appendix D.

Estimates of new impervious surface associated with the proposed highway and road projects were prepared, based upon standard lane widths, project lengths, and other appropriate areal factors. A spreadsheet was developed containing all proposed projects and their impervious areas.

A map of the projects was then overlain upon the stream basin map and the individual projects assigned to their respective basins on the spreadsheet. Where a single project overlapped one or more basins, its impervious area was split accordingly. The spreadsheet was then electronically sorted, first by alternative and then by basin. This effort yielded estimates of the basin-specific, new impervious surface area for each alternative. Appendix E contains the projects and their respective impervious areas, sorted by alternative and allocated by basin. Appendix E also contains a brief discussion of the assumptions used in calculating impervious area estimates for each project.

Estimates of total impervious area (TIA) for each of the basins were provided by the King County Department of Natural Resources (DNR) (Hartley and Burkey, personal communication, January 26, 2000). Digitized 1998 aerial photos were analyzed electronically with visual verification of test areas by staff of the Center for Urban Water Resources at the University of Washington. The procedure produces estimates of impervious surface coverage within 1 percent accuracy for areas greater than 1 square mile (640 acres) (Hill et al., 2000).

A qualitative assessment of impacts to stream flow and water quality was carried out using new impervious surface area, attributable to the set of proposed projects within each alternative, as the primary indicator. In reviewing the potential impacts, the standard requirements for treatment and detention of project-related stormwater runoff (discussed in Section 3.3.1) were assumed to be implemented as part of each project. Potentially substantial surface water impacts to the individual basins were identified using criteria described in Section 3.1, above. Mitigation measures to address these significant impacts were then identified.

■

3.2 Coordination with Agencies and Jurisdictions

The compilation of information included discussions with agencies and municipalities in the I-405 corridor. The goal was to incorporate the opinions and experiences of those most intimately knowledgeable about specific water resource concerns in the project area. Because the project area crosses numerous municipalities and jurisdictions, a select group of people was interviewed. Those chosen were water resource related representatives from the two counties and from the municipalities most affected by the proposed project alternatives. The following people were interviewed:

- City of Bellevue - Scott Taylor, Kit Paulson
- City of Kent - Bill Wilinski
- City of Redmond - Bob Franklin, Catherine Beam, Jerallyn Ruetemeyer
- City of Renton - Ron Straka, Abdoul Gafour
- City of Kirkland - Stacey Rush
- King County Department of Natural Resources, Water and Land Resources Division - Jonathan Frodge, David Hartley, Ray Heller
- Snohomish County - Mo Kashani, Craig Young, Maurine Meehan, Ellen Stewart
- Washington Department of Transportation – Guy Caley, Rick Johnson

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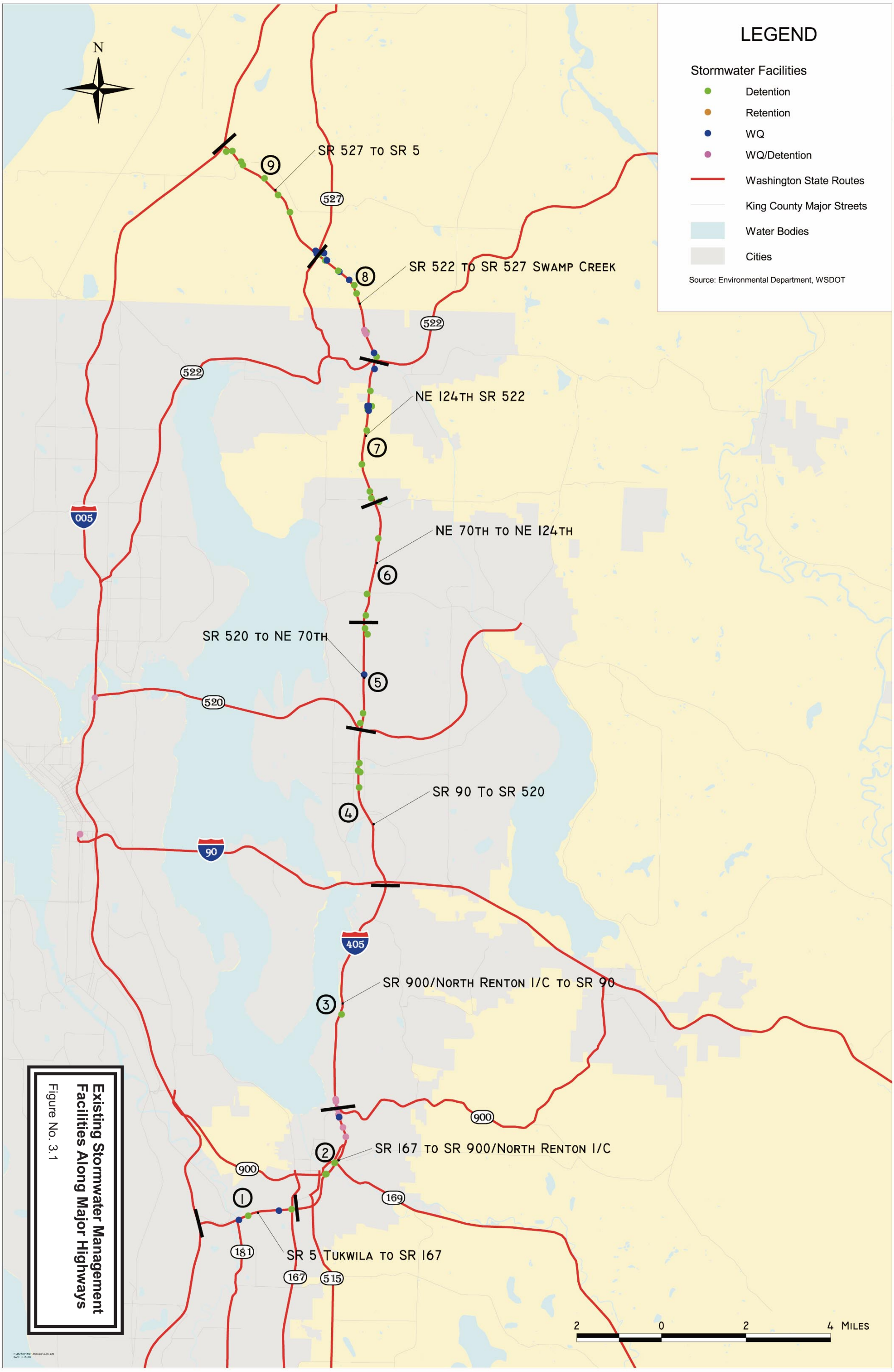

Existing Stormwater Management Facilities Along Major Highways

Figure No. 3.1

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A list of interview questions was compiled and asked of the above representatives. These questions were meant to obtain broad-based information about regional flooding and water quality problems. Local drainage concerns were sometimes discussed but were not the focus of the conversations. Specifically, the topics discussed included:

- Major flooding problems attributable to road runoff or caused by insufficient culvert / bridge openings
- Nuisance drainage problems
- Substantial water quality problems caused by road runoff
- Stream crossings with substantial erosion / channel stability problems
- Streams with very low or zero (dry) base flows
- Road crossings that block fish migration

Most municipality and jurisdiction representatives were willing to share their knowledge and information about water quality and drainage concerns in the project area. In addition, some provided additional resources, such as maps and sections of reports, to aid in the characterization of issues pertaining to the I-405 corridor. Appendix F includes a summary of each interview and the additional information provided.

Some issues were heard repeatedly while conducting these interviews. These water resource concerns are typical for the rapidly growing Central Puget Sound Region. First, there was the sentiment that it is difficult to quantify the water quality and drainage problems attributable only to roadway runoff. Most problems of this nature are a combination of increased development that includes the building of roadways. Second, I-405 affects all creeks and streams that it crosses, from the standpoint of hydrology, water quality, and fish passage and spawning. The degree to which these are affected, again, is difficult to quantify based on many other factors which contribute to these problems. Third, little water quality monitoring has been performed in the streams affected by the proposed projects. The only specific pollutants identified in these interviews were oil / grease and suspended solids. Finally, highly urbanized streams, including those in the I-405 corridor, have experienced severe changes in their hydrologic behavior. Due to increased runoff volumes, peak flows and sediment loading, the stream channel geomorphology has changed dramatically. Some impacts include a reduction in fish habitat and severe channel erosion and incision. In addition, the reduction of tree cover and groundwater baseflows has warmed some streams.

In summary, a number of local municipalities and jurisdictions provided expertise on the water quality and drainage issues affecting the I-405 corridor. The problems reported by the agencies can be characterized as typical for urban development in the Pacific Northwest.

■

3.3 Relevant Regulatory Programs and Guidelines

This section discusses the regulatory requirements for stormwater management. It also reviews the effects that the Endangered Species Act (ESA) requirements are having on stormwater management.

3.3.1 Stormwater Management

Federal and state law requires stormwater discharges to meet water quality standards. In 1992, Ecology issued the *Stormwater Management Manual for the Puget Sound Basin*, a technical manual that includes a number of Best Management Practices (BMPs) to address water quality and water quantity issues. Washington State Department of Transportation (WSDOT) has developed the *Highway Runoff Manual* to direct stormwater management programs and to adopt the BMPs recommended by the Ecology manual. This sub-section summarizes the current WSDOT program for stormwater. An updated version of this manual, covering all of Western Washington, is scheduled for release in 2001 (refer to section 3.3.2)..

According to the provisions of WAC 173-270-050 ("Puget Sound Highway Runoff Program"), all new construction projects that include more than 5,000 square feet of impervious surface are required to incorporate BMPs into the project. Permanent and temporary water quality and quantity controls to reduce downstream impacts of stormwater must be designed and installed for all required projects through the use of BMPs.

Water Quality Controls

The WSDOT *Highway Runoff Manual* Minimum Requirement 4 requires all projects to provide water quality treatment of stormwater runoff from newly created impervious surfaces. Stormwater quality BMPs are designed to remove pollutants contained in runoff. Chapter 4 of the *Highway Runoff Manual* outlines the BMP selection process.

The manual emphasizes implementation, wherever practicable, of source-control BMPs to prevent pollution, and water quality BMPs to provide pollution treatment, in that order. The goal of these BMPs is to prevent impacts to downstream properties and resources from the construction of the project. Source-control BMPs reduce or, in some cases, eliminate the need for pollution treatment by preventing it from occurring in the first place. Stormwater source controls are designed to prevent pollutants from entering stormwater by eliminating the source of pollution or by preventing contact of pollutants with rainfall and runoff. These BMPs will be used commonly during construction. However, other than street sweeping, there are almost no permanent source control BMPs that can be implemented by a state for a roadway.

Efficient and cost-effective water quality treatment BMPs to remove conventional pollutants include grass filter strips and biofiltration swales. Other water quality treatment BMPs include wet ponds, water quality infiltration ponds, and wet vaults (least preferred).

Nutrients in suspended and dissolved phases, such as nitrogen and phosphorous, can be more difficult to remove from stormwater than conventional pollutants. Although the WSDOT manual requires treatment for conventional pollutants in *all* projects with 5,000 square feet of new impervious surface, treatment for nutrients is only required when the project is located in areas specifically designated by local jurisdictions or adopted basins plans. For instance, King County has designated Lake Sammamish as sensitive to added phosphorus loading. Its stormwater manual specifies additional stormwater treatment with a goal of removing 50 percent of total phosphorus in stormwater. This is to be achieved through measures that go beyond conventional stormwater treatment, which could include an enlarged wetpond, a sand filter, or two conventional water quality treatment BMPs in series.

When water quality BMPs for conventional pollutants and nutrients (if required) are implemented, the project is in compliance with the WSDOT *Highway Runoff Manual* and the Ecology's requirements for water quality treatment of runoff from new impervious surfaces.

Water Quantity Controls

Stormwater quantity BMPs are designed to prevent an increase in the amount of runoff leaving a site after development. For all new construction projects, the WSDOT *Highway Runoff Manual* Minimum Requirement 5 requires water quantity treatment of stormwater runoff from the newly created impervious surface, unless any one of the following applies:

- The discharge is directly to a body of salt water.
- The discharge is directly to one of the major rivers listed in the Manual's Figure 2-6.1.
- The discharge is directly to a lake with a surface area greater than 300 acres.

Within the project area, discharge of stormwater (following water quality treatment) may be made to the following water bodies without detention: Lake Sammamish, Lake Washington, and the Green-Duwamish, Cedar, and Sammamish Rivers.

If stormwater is not discharged to one of the above water bodies, the project is required to provide water quantity BMPs for the new impervious surface. As with water quality treatment, Chapter 4 of the *Highway Runoff Manual* outlines the BMP selection process. Stormwater quantity BMPs include infiltration ponds, dry (or detention) ponds, and dry vaults (least preferred). Stormwater infiltration or detention provide multiple water quantity and quality benefits, including:

- Reduction of runoff rate increases caused by urban development
- Mitigation of downstream drainage capacity problems
- Recharge of groundwater resources
- Reduction or elimination of the need for downstream outfall improvements
- Decreased downstream channel erosion
- Control of sediment deposition
- Improved water quality through stormwater filtration

If applicable, dual-purpose BMPs (water quality and water quantity control both in one facility) should be selected for new construction projects. Dual-purpose BMPs are often less expensive to construct and have reduced maintenance costs compared to two separate facilities.

If the BMP selection process reveals that implementing stormwater BMPs will not be practicable (for instance, no BMPs can be designed to fit the project site), the designers must document why a prescriptive treatment should be considered nonpracticable. Offsite stormwater treatment should be identified and considered for inclusion in the project. If neither onsite nor offsite stormwater treatment is found to be practicable, then the designer's report should describe the downstream impacts that will result from not providing the treatment. The document should also discuss the stormwater treatment measures that will be included in the project, even though they will be less than required.

Retrofitting Existing Roadways as Part of New Construction

As BMPs are implemented for new impervious surfaces in construction projects, Minimum Requirements 4 and 5 require investigating the "practicality" of providing water quality and water quantity treatment for runoff from any existing impervious areas. Determining practicality involves an evaluation of a number of factors, including land availability, environmental benefit, engineering considerations, likelihood of future reconstruction, and cost. Water quality BMPs and water quantity BMPs for existing impervious runoff will be implemented whenever found practicable.

Long-Range Program for Stormwater Retrofit of Existing Highways

WAC 173-270-060(5)(a) requires that all existing highways be retrofitted with all "practicable" BMP projects either by the end of the year 2005 or 2015. The timing of these retrofitting projects will be determined in one of two ways. First, existing roadways may be retrofitted as part of new construction projects if determined to be feasible by a practicality investigation as described above.

Alternatively, if the cost-benefit analysis of the practicability investigation prevents BMPs from being implemented during new construction projects, all existing highway segments will be retrofitted either by the end of 2005 or 2015, depending on the existing traffic volumes using the highway. If the highway has an average daily traffic (ADT) of 50,000 vehicles or greater, WSDOT shall complete all practicable BMP projects or transmit highway runoff to Tribes or local governments for stormwater treatment by December 31, 2005. For all other highways, WSDOT shall complete all practicable BMP projects or transmit highway runoff to Tribes or local governments for stormwater treatment by December 31, 2015.

Local Jurisdictions

With regard to stormwater management for county or local projects, including roads, the counties, and municipalities, have been required to either adopt the Ecology manual or develop stormwater control requirements substantially equivalent to the Ecology manual. King County's *Surface Water Design Manual* underwent a thorough revision in 1998. Snohomish County's Title 24 lays out general guidelines for stormwater management. Snohomish County has adopted the Ecology manual, with some modifications, pending development of a specific County manual. Most of the local jurisdictions either have their own manual or have adopted the Ecology manual.

3.3.2 Endangered Species Act (ESA) Issues

In March 1999, the National Marine Fisheries Service (NMFS) listed the Puget Sound Chinook salmon as threatened. Stormwater management has been identified as a key area of concern. For road and highway projects, drainage and stormwater management have come under increased scrutiny. Road maintenance practices and their effects upon water quality are also being closely reviewed.

The Department of Ecology is developing a thorough revision of its 1992 stormwater management manual, which will become applicable across all of Western Washington. Titled the *Stormwater Management Manual for Western Washington* (Washington Department of Ecology, 2000), its coverage has been expanded from the Puget Sound Basin to all of Western Washington west of the Cascade Crest. One of the purposes for this revision is to achieve compliance with ESA-related

requirements for protection of water resources to assure Chinook recovery in the region. The use of a continuous simulation model resulting in generally increased runoff detention requirements and enhanced treatment for metals removal from highway runoff are two of the more substantial changes affecting management of road runoff. The draft manual is undergoing public review and is expected to be adopted in 2001. All jurisdictional stormwater runoff procedures and manuals, including those of WSDOT, will need to comply with the revised Ecology Manual. Following adoption, WSDOT will have one to two years to revise its *Highway Runoff Manual* to meet the requirements in the Ecology manual. Likewise, local jurisdictions will also be required to update their stormwater manuals.

At the county level, Snohomish, King, and Pierce counties have joined together to bring their development review regulations, maintenance programs, stormwater regulations, and other activities into compliance with ESA requirements. Known as the Tri-County ESA Response, the counties are negotiating with NMFS for inclusion of 14 elements comprising a regional stormwater management strategy under the ESA Section 4(d) Rule. Programs listed by NMFS under the 4(d) Rule are deemed to meet ESA requirements for species recovery and may proceed without further NMFS review of individual activities. NMFS has already published a list of activities covered under the 4(d) Rule (which went into effect in January 2001) and if successfully negotiated, the Tri-County programs would be added to this list.

Ten of the fourteen points are applicable to the I-405 Corridor Program:

- 2. Technical Stormwater Standards
- 3. Inspection / Enforcement
- 4. Maintenance Standards
- 8. Public Involvement / Outreach
- 9. Governmental Coordination
- 10. Monitoring
- 11. Stormwater Planning
- 12. Capital Improvement Program
- 13. Habitat Enhancement / Rehabilitation
- 14. Habitat Acquisition

Many of these elements of stormwater management are already implemented under state stormwater regulations. As of the date of this report, only Item No. 4, Road Maintenance, had been successfully negotiated with NMFS. It should be noted that WSDOT is not a party to the Tri-County ESA Response Initiative.

4 AFFECTED ENVIRONMENT

4.1 Overview of Water Resources

From a national perspective, the project area contains an abundant water resource base. Major surface water features include two large lakes, three rivers, eleven major streams, and numerous smaller lakes and streams. The project area lies within two State Water Resource Inventory Areas (WRIAs). The southern 10 percent lies within WRIA 9 – Green-Duwamish River Basin. The remainder lies within WRIA 8 – Lake Washington Basin (Cedar-Sammamish Rivers). Both WRIAs drain to Central Puget Sound a few miles downstream of the project area. The upper portions of the Green and Cedar river basins have undergone relatively little development and most of the land cover is second-growth forest. The lower portions of these basins, in contrast, have undergone extensive land use changes in the form of either agriculture or urban and residential development. Similarly, the basins of the major streams in the project area are also largely developed or are experiencing relatively rapid growth.

4.2 Streams and Lakes

This sections contains a brief discussion of the major basins within the project area. Selected references describing these basins in considerably more detail can be found in Section 7 – References. Figure 4.1 shows the major streams and lakes within the project area. Table 4.1 presents selected flow statistics for the major streams in the project area, where data exist. These data were derived from published U.S. Geological Survey information. I-405, the central road feature of the project area, crosses most of these streams. Each of the streams is briefly discussed in order, generally from south to north.

Figure 4.2 shows the floodplains associated with these streams. Floodplain impacts are analyzed in a separate Floodplain Expertise Report.

Soos Creek drains an urbanizing area of south King County. This stream rises in the eastern side of the project area and flows south for 10 miles. It then turns west and joins the Green River just upstream of the city of Auburn. Most of its watershed has low to medium density residential development with scattered pasture lands. Rapid residential development is occurring in the recently incorporated town of Covington and in the eastern portions of Kent and Auburn. Despite this, the stream remains one of the most important salmon streams within the urban portions of King County. A large portion of its upper and middle riparian area is preserved as open space or parkland. The relatively broad stream valley and gentle gradient of the stream allow for considerable shallow flooding and natural storage of flow during higher runoff periods. As a result, the hydrology and water quality of this stream has not been as dramatically altered as many of the other streams in the project area. A fish hatchery is operated near the mouth of this stream. I-405 does not cross this stream. However, several proposed arterial projects are proposed in the upper portion of its basin. This basin covers 9,400 acres within the project area. Total impervious area (TIA) coverage is 17 percent.

The **Green River** rises in the Cascade Mountains 50 miles southeast of the project area. Its flow is partially controlled by Howard Hanson Dam, operated by the Army Corps of Engineers. It enters the low-gradient, Kent-Auburn valley and flows north into the project area at Kent. Formerly agricultural, much of the valley has transformed to commercial and warehouse development. The river has been channelized through the valley. At the north end of the project area, at its junction with the Black River, the Green River becomes known as the **Duwamish River**. I-405 crosses the Green River a short distance upstream of this point. The Duwamish continues its path through a heavily industrialized portion of Seattle before discharging into Elliott Bay. This basin covers about 3,000 acres within the project area. TIA coverage is 39 percent.

Springbrook Creek flows north through the Kent-Auburn valley and generally parallel to the Green River. It receives runoff from most of this valley and from the plateau to the east. Its drainage area includes downtown Kent. It also includes large areas of warehousing and industrial activities as well as the large commercial center centered around the Southcenter Mall. Within the valley floor, this stream channel has been heavily altered, although substantial areas of wetland remain. This stream joins the Black River a short distance above its confluence with the Green River. I-405 crosses the creek at about this point.

As an historical note, the Black River formerly drained Lake Washington into the Duwamish River. However, early in the last century, Lake Washington was lowered and its outlet re-routed (see below). As a result, Springbrook Creek became the dominant contributor to what was left of the Black River drainage. This basin covers about 14,300 acres within the project area. TIA coverage is 44 percent.

The **Cedar River** rises in the Cascade Mountains, immediately north of the Green River Basin, 45 miles southeast of the project area. It flows through Chester Morse Reservoir (operated by the City of Seattle), past the town of Maple Valley, and down the Cedar River valley to Renton. The river discharges into the south end of Lake Washington at Renton. Lake Washington, in turn, discharges west through the Lake Washington Ship Canal and the ship locks at Ballard into Puget Sound. The great majority of the Cedar River Basin is forested, with rural development along its middle and lower length. The lower 2 miles of the river flow through Renton and are heavily urbanized. I-405 crosses the river a little more than 1 mile above its mouth at Lake Washington. This basin covers a little less than 14,000 acres within the project area. TIA coverage specific to the project area was not available.

May Creek rises in rural King County, east of Renton. The lower portion of its basin has undergone residential development. I-405 crosses the stream near its mouth, a short distance above Lake Washington. This basin covers about 35,900 acres within the project area. TIA coverage is 22 percent.

Legend: Stream Basins

- Streams
- Drainage Basins
- East Lake Washington — Drainage Basin Labels
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Stream Basins

Figure No. 4.1

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Table 4.1: Basic Flow Statistics for Selected Streams in the Study Area

Stream	Location	Station #	Drainage Area (mi^2)	Period of Record	Mean Flow (cfs)	Flow (cfs) Max. - Min.
Soos	Auburn	12112600	66.7	1960 – P	125	4,200 - 11
Green-Black	Auburn	12113000	399	1937 – P	1,336	28,100 - 81
Springbrook	Orillia	12113346	8.4	1993 – P	9.8	450 – 0.7
Cedar River	Renton	1211900	184	1945 – P	667	10,600 - 30
May Creek	Renton	12119600	12.7	1945 - 1979	N/A	510 – N/A
Coal Creek	Bellevue	12119700	6.8	1964 – 1979	N/A	362 - N/A
Mercer Creek	Bellevue	12120000	12.0	1955 – P	22.6	832 – 1.9
Juanita	Kirkland	12120500	6.7	1974 – 90	11.1	740 – 0.4
Sammamish	Woodinville	12125200	159	1965 – P	311	2,870 – 27
Evans	Redmond	12124000	14.8	1955 – 86	23.6	222 – 3.9
Bear	Redmond	12122500	13.5	1979 – 96	26.9	420 – 3.1
North Creek	Bothell	12126000	24.6	1946 – 74	N/A	680 - N/A
Swamp	Kenmore	12127100	23.1	1964 – 90	34.5	1,090 – 2.3
Lyon	Forest Park	12127300	3.7	1964 – 75	N/A	154 - N/A
Tibbetts	Issaquah	12121700	3.9	1964 – 77	N/A	359 - N/A
Issaquah	Issaquah	12121600	56.6	1963 – P	133	3,200 - 10

P – Present; N/A – Not available.

Sources: U. S. Geological Survey Water Resources Data for Washington (Annual Reports); U.S.G.S. – National Water Information System, www.usgs.gov/wa/nwis)

Coal Creek rises on Cougar Mountain, 4 miles east of Lake Washington. Its headwaters are in a regional county park and a portion of its upper watershed was a coal mining area a century ago. The creek still suffers from excessive sedimentation due primarily to landslides from highly unstable mine tailings slopes. Most of the Coal Creek Basin has undergone residential development. However, the riparian corridor of this stream has been preserved as county parkland. I-405 crosses this stream about a mile above its mouth. This basin covers about 3,000 acres within the project area. TIA coverage is 28 percent.

The **Kelsey-South Kelsey, Forbes, and Juanita basins** are all heavily urbanized. These basins drain much of the cities of Bellevue and Kirkland. Kelsey Creek drains to Mercer Slough, an important wetland area bordering Lake Washington. At the mouth of Juanita Creek is a heavily developed park with a swimming beach. Development within these basins includes single- and

multi-family residential and commercial uses. Major portions of these creeks and their tributaries have been heavily altered. I-405 crosses these streams generally along their middle reach. Collectively, these basins cover about 17,000 acres within the project area. TIA coverage is 45 percent.

The **East Lake Washington Basin** includes the smaller streams that flow directly to the lake. This basin extends along the eastern shore of Lake Washington but excludes the mouths of the larger Lake Washington streams mentioned above. This basin includes the downtown areas of Bellevue and Kirkland and much of it is heavily urbanized. Portions of the basin adjacent to the north and south portions of the lake are quite steep. This basin covers about 13,000 acres within the project area. TIA coverage is 40 percent.

The Sammamish River flows from the north end of **Lake Sammamish**, a large lake located along the east side of the project area, to the north end of Lake Washington. The plateau areas along the east and west shores of the lake are largely developed in residential use. The City of Issaquah lies at the south end of the lake. Tibbetts and Issaquah Creeks are the largest tributaries to the lake. They drain a mountainous, largely forested area south and east of the lake. Major parks lie on the north and the south ends of the lake and boating, swimming, and fishing are popular activities.

The **Sammamish River** flows through a low-gradient valley ranging in width from several miles at its upper end to about one-quarter mile near its lower end. After first flowing through a regional park, the river passes through downtown Redmond, through a commercial and office complex and a golf course. The middle stretch of the river is devoted to open space and agricultural uses. After passing through the City of Woodinville, the river turns west, flowing through Bothell and Kenmore and into Lake Washington. In addition to the commercial areas of each of the aforementioned cities, much of the area in the lower Sammamish River Basin is either residential or undergoing relatively rapid residential development. The river itself was channelized decades ago. I-405 crosses the Sammamish River in Bothell, about 4 miles east of Lake Washington. This basin covers about 16,400 acres within the project area. TIA coverage is 37 percent.

The Sammamish River has several important tributaries that are treated as basins for purposes of this report. **Bear Creek** joins the Sammamish River at Redmond, a short distance downstream of where it flows out of Lake Sammamish. This basin is largely forested but is undergoing extensive residential development. Much of the riparian area along this stream has remained undeveloped and the stream supports important salmon runs. **Evans Creek** is an important tributary to Bear Creek. The Bear Creek Basin lies to the east of I-405, but several proposed highway or arterial upgrades would affect this basin. This basin covers about 11,000 acres within the project area. TIA coverage is 23 percent.

The areas of the remaining three basins, Little Bear, North, and Swamp creeks, lie primarily within south Snohomish County and only their lower portions lie within King County. **Little Bear Creek** joins the Sammamish River at Woodinville. Most of its upper basin supports low-density residential use. However, its lower stretch through Woodinville is bordered by commercial and industrial land activities and has been extensively channelized. The Little Bear basin covers about 3,000 acres within the project area. TIA coverage is 28 percent.

The upper portions of **North and Swamp creeks** lie within the cities of Mill Creek and Lynnwood and are heavily developed. Predominant activities in these basins include residential, commercial, and office uses. I-405 crosses Swamp Creek a short distance south of I-5, in the north portion of the

Legend: 100-year Floodplains

- 100 Year Floodplain
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Mill Creek
Lynnwood
Edmonds
Woodway
Mountlake Terrace
Brier
Bothell
Kenmore
Woodinville
SNOHOMISH
KING
Shoreline
Lake Forest Park
Simonds Rd NE
Duvall
NE 128th St
Kirkland
Redmond
Lake Washington
Union Bay
Lake Union
Yarrow Point
Hunts Point
Clyde Hill
Medina
NE 8th St
Bellevue
148th Ave SE
Lake Sammamish
Redmond Fall City Rd
Seattle
Beaux Arts
Sammamish
Mercer Island
Duwamish River
Coal Creek Pky SE
Newcastle
Issaquah
Tukwila
SE 128th St
Renton
Burien
Normandy Park
SeaTac
SE Petrovitsky Rd
68th Ave
Kent
132nd Ave SE
Des Moines
Maple Valley
Covington
Auburn
Federal Way

100-Year Floodplains

Figure No. 4.2

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project area. Snohomish County has constructed a regional detention facility along the middle stretch of Swamp Creek, just upstream of I-5, to help alleviate downstream flooding. Much of the riparian corridor through this middle stretch has remained in open space. The lowest stretch of North Creek, where it crosses I-405, is also planned for wetland preservation and enhancement. Collectively, these two basins cover about 15,000 acres within the project area. TIA coverage is 39 percent.

Lake Washington forms the western side of the project area. It averages 1 to 3 miles in width and extends 18 miles from Renton to Kenmore. Approximately 90 percent of the project area drains to this lake, one of the largest in Washington. Its two largest tributaries are the Cedar and Sammamish rivers (discussed above). On its western shore, opposite the project area, is the City of Seattle. The lake is a major recreational feature in the region, with heavy use for swimming, fishing, and boating.

The overall total impervious area coverage within the 134,000-acre study area is 36 percent. Individual basins range from a low of 17 percent impervious area for the Soos Creek Basin to a high of 55 percent impervious area for the Duwamish River Basin. Research on urban streams by the University of Washington Center for Urban Water Resources suggests that substantial declines in stream invertebrate populations and other measures of stream health occur when development within a basin reaches about 10 percent impervious area (May et al., 1997).

■

4.3 Water Quality

The State has classified all surface water bodies into five water quality categories: Class AA, Class A, Class B, Class C, or Lake Class. Class AA are typically waters of extraordinarily good quality, while Class A waters are classified as excellent quality (WAC 173-201A-120). The State Water Quality Standards are shown in Appendix C. Table 4.2 shows the water quality classifications of the major surface water bodies in the project area. The state regulations specifically designate the lower Cedar and Green rivers as Class A. Soos and Springbrook creeks drain to the Green River and therefore are also Class A. The Duwamish River is specifically designated as Class B. The two lakes, Lake Sammamish and Lake Washington, are generally designated as Lake Class. By regulation, all streams draining to lakes, and not otherwise specifically designated, are Class AA. The remainder of the streams in Table 4.2 drain to Lake Washington and are therefore Class AA streams.

The system discussed in the previous paragraph is known as a classification-based system Ecology is proposing to revise the state surface water quality standards to a use-based system. Under this latter system, the specific uses which are assigned to each water body would determine the water quality standards applicable to that water body. Water temperature and dissolved oxygen standards would be keyed to the designated uses for fish as follows:

- Bull Trout and Dolly Varden
- Salmonid Spawning
- Salmonid Rearing
- Non-Migratory Trout
- Warm Water Fish

As one proceeds down the list, the standards would allow for progressively warmer water temperature and lower dissolved oxygen concentrations. In addition, the current *fecal coliform* bacterial standard would change to *enterococci*, which is considered a superior indicator of the potential presence of pathogens. Ecology expects to adopt the use-based water quality standards system in 2001. Following that, the use designations for individual water bodies will be carried out.

Table 4.2 also shows the King County Stream Classification for each of the streams. This classification refers to the general size of the stream. Class 1 covers the larger streams, which are "Shorelines of the State" as defined under the County Shoreline Master Program. Class 2 streams are other perennial streams or streams used by salmon (Class 2*). Class 3 are intermittent streams which are not utilized by salmon. The three rivers and half of the major streams in the project area are Class 1. Most of the remaining streams are Class 2*—other streams supporting salmon.

Table 4.2: Classification of the Major Streams and Lakes[1]

Water Body	State WQ Class	King Co. Stream Class
Bear-Evans Creek	AA	1
Cedar River[2]	A	1
Coal Creek	AA	2
Duwamish River	B	1
Forbes Creek	AA	Unclassified
Juanita Creek	AA	2*
Kelsey Creek	AA	1
Green River	A	1
Little Bear Creek	AA	2*
Sammamish River	AA	1
May Creek	AA	2*
North Creek	AA	1
Soos Creek	A	2*
Spring Brook Creek	A	2*
Swamp Creek	AA	1
Lake Sammamish	Lake	Not Applicable
Lake Washington	Lake	Not Applicable

1) See text for explanation of class type.
2) Class AA above River Mile 4.1.

Extensive water quality data exist for the streams in the project area, much of it collected more than a decade ago. Every 2 years, the Ecology publishes a statewide water quality assessment known as the Section 305b Report. The most recent report was published this past summer (Beckett, 2000). Appendix A of that report contains a list of 643 impaired and threatened water bodies, known as the "303d List." These are water bodies that violate one or more water quality standards and which are not expected to improve over the next several years. Figure 4.3 shows the 303d-listed streams in the project area. Table 4.3 shows the parameters that do not meet water quality standards. Data used to compile the 303d List comes from research studies, from various agencies, such as the U.S. Geological Survey, and from studies conducted by Ecology itself. Virtually all of the basins in the project area have streams that regularly violate one or more of the state water quality standards one or more times each year. All of the streams fail to meet the fecal coliform standard. Lakes Sammamish and Washington have periodic bacteria violations at a number of public swimming beaches along their shorelines. In rural areas, livestock and failing septic tanks are typical sources of this pollutant. Urban runoff, including road and highway runoff, also has a typically high coliform count.

About one-third of the water bodies have violations of the temperature standard. This is often the result of a lack of forest canopy in the riparian area surrounding a stream. On warm summer days, direct sunlight, combined with typically low seasonal flows, can warm a stream, resulting in a water quality violation. Warm waters also retain a lower level of dissolved oxygen. A number of the lower-gradient, sluggish streams in the project area show violations of the dissolved oxygen standard.

The Green River and Springbrook, May, and Bear-Evans creeks show elevated levels of one or more heavy metals. The Sammamish River has a pH violation, while Kelsey Creek has shown elevated levels of three pesticides.

Streams on the 303d List are required to undergo a study which leads to an allocation of allowable input of the offending pollutants such that water quality standards can be achieved. This allocation is known as Total Maximum Daily Load (TMDL). In 1993, Ecology assigned a TMDL Lower Green/Duwamish River. This TMDL covers ammonia-nitrogen. It was directed primarily at the discharge from the Renton Wastewater Treatment Plant, which formerly was discharged into the lower Green/Duwamish river. This discharge had been identified as the primary contributor to elevated ammonia levels and reduced levels of dissolved oxygen in the river. Since that time, an extended wastewater outfall has been constructed in Puget Sound and the treatment plant no longer discharges to the lower Green/Duwamish River. A TMDL covering coliform bacteria is under consideration for North Creek. A technical report on this topic has been submitted to the Environmental Protection Agency (D. Garland, Washington Department of Ecology, February 26, 2001, personal communication).

Table 4.3: Section 303d-Listed Streams and Lakes

WATER BODY	Tempera-ture	F. Coliforms	Dis. Oxygen	Other Parameters
Bear Creek		x		Hg,Cr
Cedar River		x		
Coal Creek		x		
Duwamish River		x		pH;Numerous metals and organics
Fairweather Creek	x	x		
Forbes Creek		x		
Green River	x	x		Hg,Cr
Juanita Creek		x		
Kelsey Creek		x		Heptachlor epoxide,dieldrin, DDT
Little Bear Creek		x		
May Creek	x	x		Cu,Pb,Zn
Mercer Slough		x	x	pH
North Creek		x	x	
Sammamish River	x	x	x	pH
Soos Creek	x	x	x	
Springbrook Creek	x	x	x	Cd,Cr,Cu,Hg,Zn
Swamp Creek		x	x	
Yarrow Bay Creek		x		
Lake Sammamish		x		
Lake Washington		x		

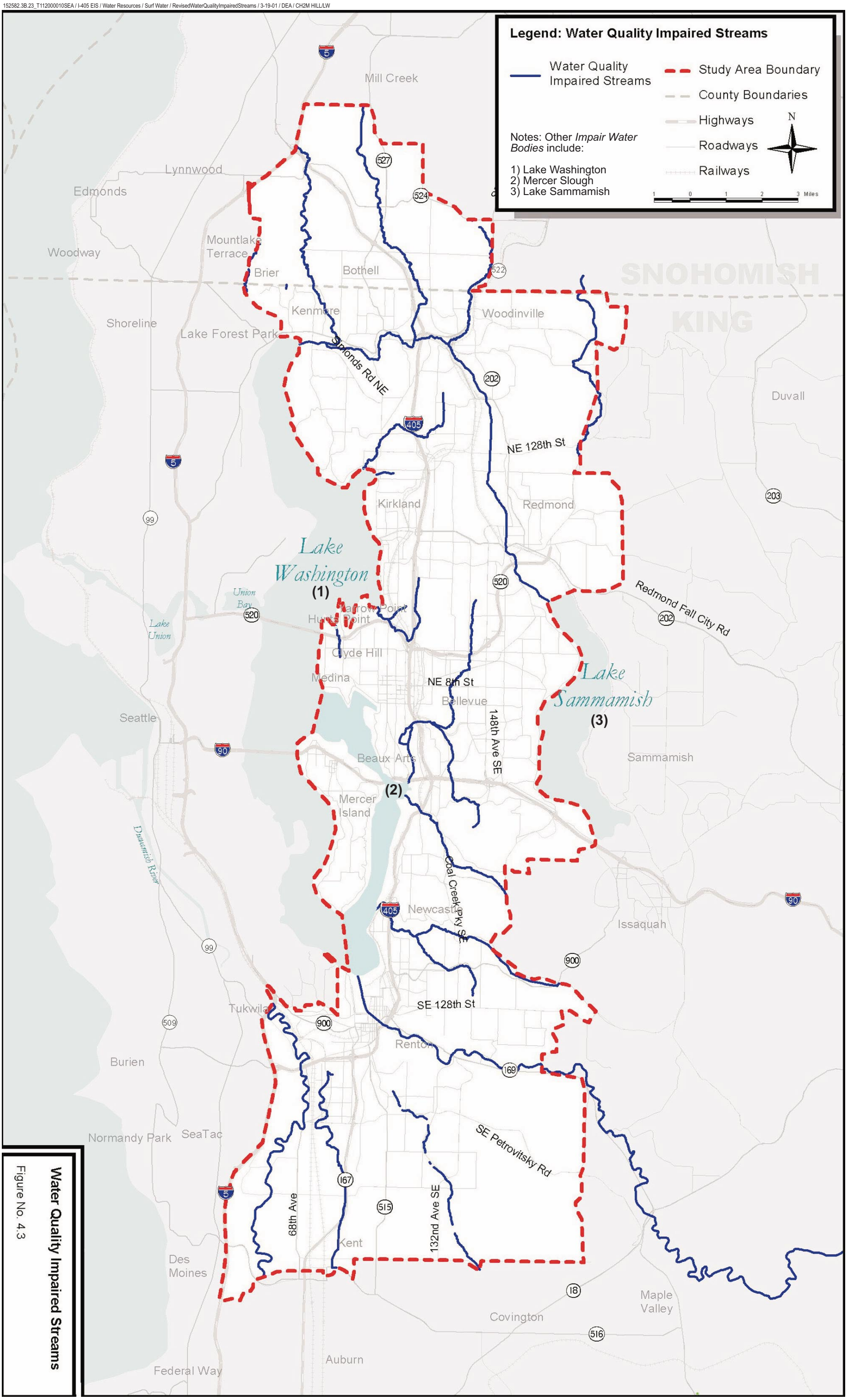
■

4.4 Drainage and Water Quality Issues

Road and highway projects can negatively impact water resources in a number of ways. Replacement of native or second-growth forest cover with cleared road right-of-way, ditches, road shoulders, and road pavement substantially reduces the amount of rainfall that is evaporated back into the air and the portion that is infiltrated into the soil. As a result, roadway areas are warmer and drier and create higher peak stream flows and more rapid changes in stream flows than forested areas. Summer base flows tend to be reduced. Roadways built within riparian corridors can impact the functions of riparian areas and reduce or isolate flood plains.

Roadways that cross water bodies can directly affect stream channels, reducing stream channel cross-section or diverting the location of the channel.

Construction, operation, and maintenance of roadways discharge pollutants to water bodies. These pollutants include silt, chemicals, paints, and solvents and fuels used by construction equipment. Pollutants from operations include silt, hydrocarbons, metals, nutrients, and



Water Quality Impaired Streams

Figure No. 4.3

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pathogens due to traffic and airborne deposition. Similar pollutants are generated by maintenance activities, particularly silt, pesticides, and de-icing materials.

In forested watersheds, hydrology is shaped by the trees and the canopy they provide. In an undisturbed, forested watershed, approximately 40 percent of the annual precipitation goes right back into the air through direct evaporation or transpiration by the trees. Most of the remainder goes into the ground. There is typically little or no runoff in a forest. Because of the loss of trees and the construction of impervious surfaces and drainage systems, urban watersheds have higher peak stream flows, lower summer flows, and more variability between storms. These changes affect the physical habitat for fish, the insects that the fish live on, and the fish directly. As a result of the increased peak flows, turbidity often increases.

Changes in stream hydraulics often change the shape and structure of the river bank and can permanently alter the flow of a river and the aquatic habitat. In urban areas, highways tend to have high traffic counts that result in higher concentrations of pollutants. For these reasons, the impacts of pollutants in highway runoff are often far more severe in urban areas and more likely to be a limiting factor for aquatic organisms.

Replacing the native forest cover with development substantially reduces the amount of rainfall that is evaporated back into the air and the portion that is infiltrated into the soil. In forested areas, none of the available stormwater management practices compensate for the loss in evapotranspiration and few of the infiltration facilities are entirely effective. As a result, urban areas are warmer and drier and experience higher peak stream flows, lower summer flows, and more rapid changes in flows than forested areas.

Infiltration of treated stormwater is the preferred approach to managing runoff. The approach not only removes the peak runoff from the receiving stream, it also recharges the local groundwater system and provides water later on for maintenance of base stream flow. Much of the project area is underlain by a shallow, dense, impermeable material known as glacial till, making it unsuitable for infiltration. Nonetheless, about 40 percent of the project area is underlain by alluvium, outwash, and other soils which are amenable for infiltration. Figure 4.4 shows the locations of soils potentially suitable for stormwater recharge.

The ditches that accompany a road system may have as great an impact on stream hydrology as impervious surfaces. This is because they rapidly collect and convey runoff to discharge points which are often existing streams or natural swales. The hydrologic impacts of ditches that are not associated with new impervious surfaces are often not addressed.

Figure 3.1 shows dots representing the existing stormwater treatment and detention facilities installed along the major highways within the project area. Along I-405 there are a total of 37 detention facilities, 12 water quality treatment facilities, and 7 combined facilities.

Their distribution by highway segment is shown below:

- Segment 1 – I-5 to SR 167 4 facilities
- Segment 2 – SR 167 to SR 900 6 facilities
- Segment 3 – SR 900 to I-90 3 facility
- Segment 4 – I-90 to SR 520 4 facilities
- Segment 5 – SR 520 to NE 70th 5 facilities

- Segment 6 – NE 70th to NE 124th 4 facilities
- Segment 6 – NE 124th to SR 522 9 facilities
- Segment 8 – SR 522 to SR 526 13 facilities
- Segment 9 – SR 527 to I-5 8 facilities

Information on the specific portions of I-405 served by these facilities was not readily available. However, it can be seen from Figure 3.1 that the southern portion of I-405 has relatively few stormwater facilities. The northern portion of I-405 has the largest number of stormwater facilities in operation.

WSDOT Highway Maintenance crews are responsible for maintaining all stormwater facilities and conveyance systems in addition to other highway maintenance along I-405. Maintenance crews monitor stormwater facilities at a frequency varying from 3 months to 2 years. Standard maintenance procedures for stormwater facilities include street sweeping, mowing ditches, R/D ponds, grass filter strips, and bioswales, vactoring catch basins, vaults, and tanks, and removing sediment from R/D ponds. Maintenance criteria outlined in Section 7 of the WSDOT Highway Runoff Manual is followed and performed on an as-needed basis. Sediment is removed from R/D ponds with a small excavator when the sediment reaches 10 percent of the pond's storage volume.

Thorough maintenance has been difficult along the I-405 corridor due to a lack of funding. Equipment needs of the WSDOT Maintenance Office are not met, and it is difficult to find and keep qualified personnel (Phil George, personal communication, 2001). As a result of emerging ESA guidelines, highway maintenance practices are changing. For instance, the grass that is cut from filter strips and bioswales is now to be removed where it was previously mulched. Strip ditching is now carried out, whereby sections of a ditch remain untouched when ditch cleaning is carried out.

Legend: Soils Potentially Suitable for Stormwater Recharge

- Infiltrative Soils
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Mill Creek
Lynnwood
Edmonds
Mountlake Terrace
Woodway
Brier
Bothell
Kenmore
Woodinville
SNOHOMISH
KING
Shoreline
Lake Forest Park
Simonds Rd NE
Duvall
NE 128th St
Kirkland
Redmond
Lake Washington
Union Bay
Lake Union
Yarrow Point
Hunts Point
Clyde Hill
Medina
NE 8th St
Bellevue
Lake Sammamish
Redmond Fall City Rd
Seattle
Beaux Arts
Mercer Island
148th Ave SE
Sammamish
Duwamish River
Coal Creek Pky SE
Newcastle
Issaquah
Tukwila
SE 128th St
Renton
Burien
Normandy Park
SeaTac
SE Petrovitsky Rd
68th Ave S
132nd Ave SE
Kent
Des Moines
Maple Valley
Covington
Auburn
Federal Way

Soils Potentially Suitable for Stormwater Recharge

Figure No. 4.4

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5 IMPACT ANALYSIS

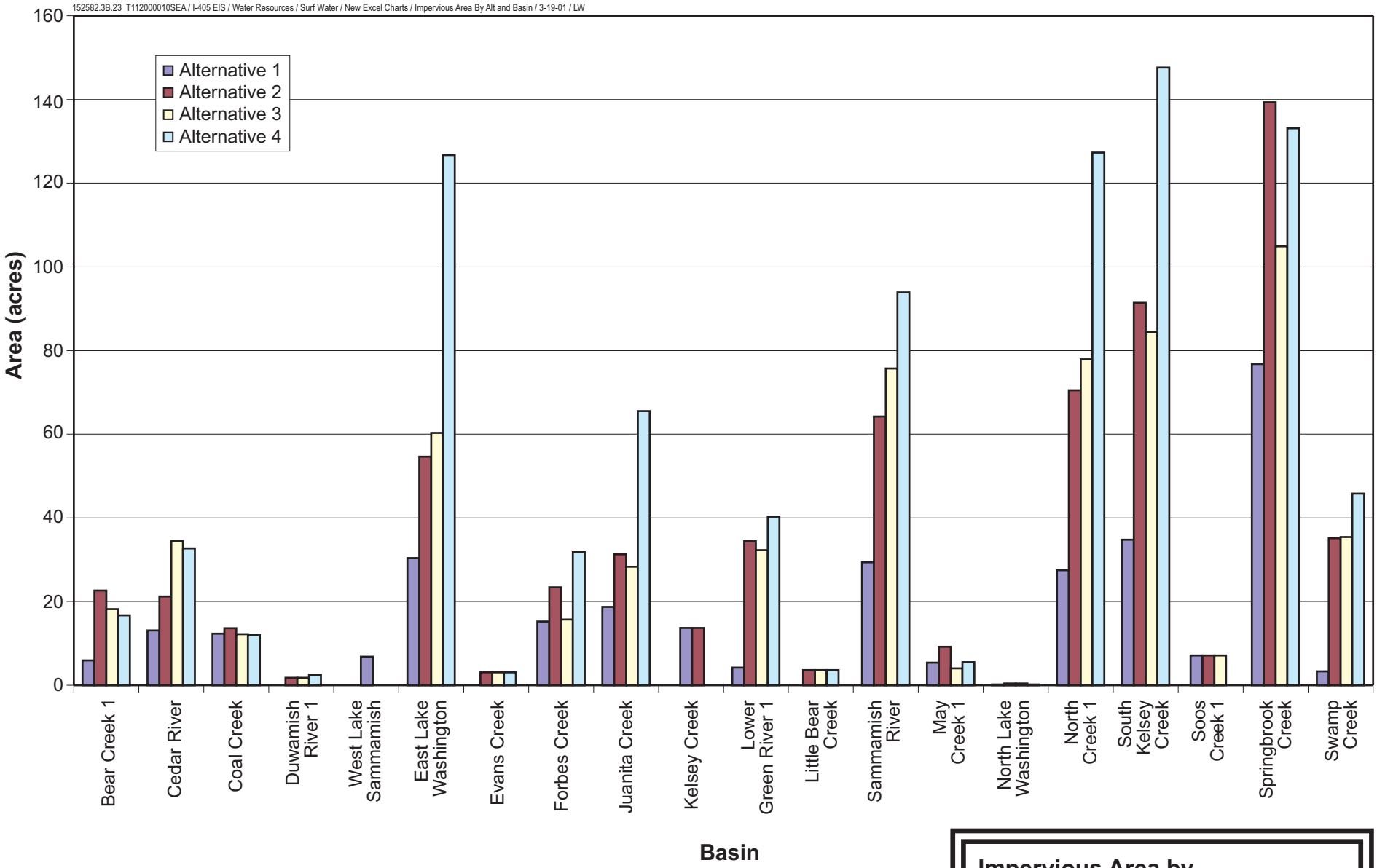
Section 5 discusses the general runoff and water quality impacts due to highway construction and operation. The following subsections discuss the impacts of each alternative upon the streams in the project area. Section 5.2 discusses the impacts of the No-Action Alternative. Table 5-1 lists the amount of new impervious area generated, by basin, under the No-Action Alternative. Sections 5.3 through 5.6 review the *additional* impacts (in addition to those of the No-Action Alternative) of each of the four project alternatives. Figure 5.1 shows the amount of new impervious surface generated within each basin by alternative. Spreadsheets with supporting data can be found in Appendix G. Estimated increases in project operational pollutant loads for I-405 are shown, by alternative, in Figure 5.2. Estimates broken down by highway segment can be found in Appendix D.

Table 5.1: No-Action Alternative New Impervious Area

Basin	Basin Area within Project (Acres)	% of Impervious [2]	Impervious Area within Project (Acres)	No-Action Alternative	
				New Imp. Area	% Conv.[4]
Bear Creek [1]	9,343	23%	2149	0	0.0%
Cedar River	13,809	see note 3	---	11.7	
Coal Creek	3,020	28%	846	1.3	0.0%
Duwamish River [1]	816	55%	449	0.0	0.0%
West Lake Sammamish	7,291	40%	2916	5.1	0.1%
East Lake Washington	13,104	40%	5242	13	0.1%
Evans Creek	1,560	22%	343	9.3	0.6%
Forbes Creek	2,322	43%	998	0	0.0%
Juanita Creek	4,208	45%	1894	10.4	0.2%
Kelsey Creek	5,291	44%	2328	0	0.0%
Lower Green River [1]	3,021	39%	1178	0	0.0%
Little Bear Creek	3,022	28%	846	14.6	0.5%
Sammamish River	16,375	37%	6059	18.9	0.1%
May Creek [1]	5,858	22%	1289	9.1	0.2%
North Lake Washington	1,079	43%	464	0	0.0%
North Creek [1]	8,357	38%	3176	32.8	0.4%
South Kelsey Creek	5,137	46%	2363	12.4	0.2%
Soos Creek [1]	9,408	17%	1599	7.8	0.1%
Springbrook Creek	14,293	44%	6289	5.7	0.0%
Swamp Creek [1]	6,733	41%	2761	11.5	0.2%
Total	**134,047**	36%[5]	**43,188**	**163.6**	**0.1%**

Note:

1. A portion of this basin lies outside the project area.
2. Unpublished data, King County DNR GIS Data
3. The available impervious area information for this basin covers a very large forested area outside of study area and was therefore not suitable for use.
4. Percentage conversion to new impervious surface. (New Imp. Area/Basin Area within Project.)
5. Excluding the Cedar Basin.



Impervious Area by Alternative and Basin

Figure No. 5.1

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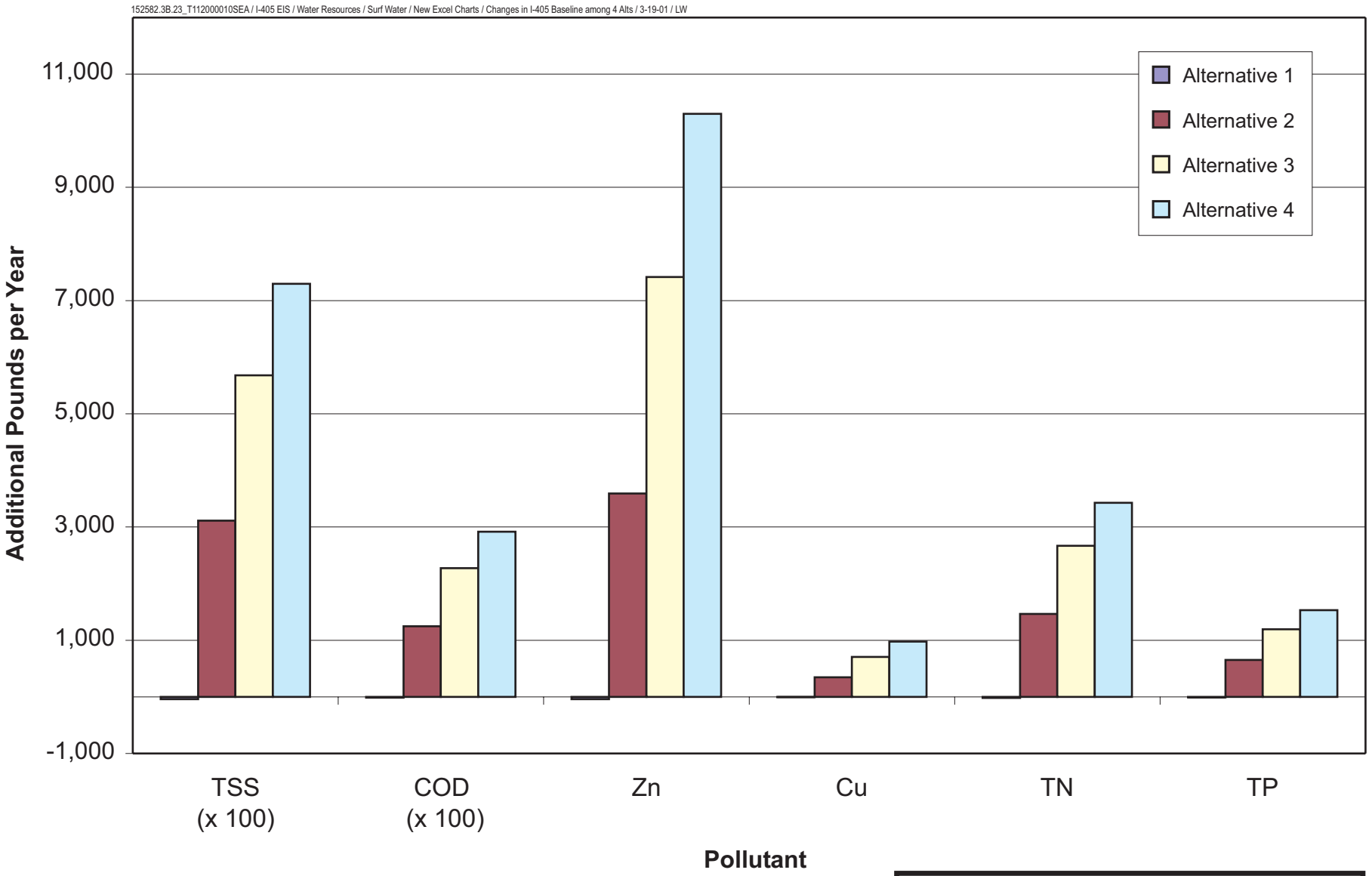

Change in I-405 Baseline Pollutant Loading Among the Four Alternatives

Figure No. 5.2

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5.1 Evaluation Criteria

The following criteria were used to define potentially substantial surface water impacts:

- Multiple projects within an alternative (five or more with each disturbing greater than 1 acre; refer to Appendix G) occurring within basins with a high proportion of steeply sloping area were judged to result in potentially substantial water quality impacts during construction.
- Potentially substantial operational impacts were judged to occur within basins experiencing a substantial increase in impervious surface (1 percent or greater of total basin area) which could result in a permanent reduction in stream base flow. A project-related increase of 1 percent impervious area was judged to be the minimum threshold for any appreciable impact upon baseline recharge and associated base flow reduction within a basin.
- A number of streams in the project area currently violate water quality standards for temperature and/or heavy metals. If the project alternative results in a substantial increase in impervious area in such a basin, the associated decrease in base flow could worsen the stream temperature problem. Increased road runoff could intensify metals concentrations in such a stream. Either of these situations was judged to be a potentially substantial operational impact to water quality.

The impact analysis assumes that as part of each project, the standard erosion and sediment control measures and permanent stormwater detention and treatment requirements specified in the *Stormwater Management Manual for Western Washington* (Washington Department of Ecology, 2000) will be implemented. When this manual is finalized in 2001, the specific requirements in that manual will be applicable (refer to Section 3.3.2).

5.2 No-Action Alternative

5.2.1 Construction Impacts

Under the No-Action Alternative, one basin, North Creek, would have five projects constructed within its boundaries.

These projects would have the potential to temporarily degrade water quality during construction. Standard Best Management Practices (BMPs) for control of erosion and other pollutants would be implemented during construction, as required by the *Stormwater Management Manual for Western Washington*. These BAPs will minimize erosion and sedimentation to water bodies. However, one of the streams, North Creek, will have the potential to suffer serious, short-term water quality degradation due to a combination of its sloping nature and the relatively high number of projects proposed for construction (five or more). Wet-weather construction within this basin may seriously degrade water quality. Substantial, short-term impacts can be avoided by implementing the wet-weather practices discussed in Section 5.8 (Mitigation Measures).

5.2.2 Operational Impacts

The No-Action Alternative would result in 164 acres of new impervious surface within the project area. This would represent a 0.1 percent increase in impervious area across the project area. The North Creek Basin would receive the most new impervious surface, 33 acres (Table 5-1). Other basins receiving 15 or more acres of new impervious surface would include Sammamish River and Little Bear Creek. The Lower Green and Duwamish rivers and Bear, Coal, Forbes, and Kelsey creeks would each experience less than 5 acres of new impervious surface. On a relative basis, Evans and North creeks would experience the greatest impact, about 0.5 percent increase in impervious surface each.

The proposed road project under this alternative would result in an increase in runoff to local drainage systems and streams. The standard detention requirements for new projects will be generally sufficient to avoid causing or intensifying downstream drainage or flooding problems. However, runoff detention will not fully offset the changes in hydrology due to increased runoff volumes. The reduction in pervious area and its associated groundwater recharge will increase the frequency of moderate (return intervals of 1 year, or less) stream flows and may result in a reduction in dry season base flows in several of the streams mentioned above. But given the small relative decreases in pervious surface likely to occur in any single basin, it is doubtful that any measurable reduction in base flow will occur.

Annual pollutant loads attributable to traffic along I-405 under the No-Action Alternative were calculated. A total of approximately 410 tons of suspended solids would be generated along the entire length of I-405. Segment 7 would generate the highest load: 75 tons. Total annual loads (rounded) for other pollutants would be:

- Chemical oxygen demand (COD) 160 tons
- Zinc 4,200 pounds
- Copper 430 pounds
- Total Nitrogen 3,900 pounds
- Total Phosphorus 1,700 pounds

The above figures represent potential pollutant loading *before* stormwater treatment measures. Standard water quality treatment can reduce 80 percent of the suspended solids and COD and 40 to 60 percent of the metals and nutrients present in road runoff. As shown in Figure 3.1, there are a number of stormwater treatment facilities currently installed along I-405. Although their effectiveness in reducing overall highway pollutant loads has not been quantified regionally, actual pollutant loadings to the surface waters in the project area would be lower than the figures shown above.

Stormwater treatment would be implemented for new impervious surfaces associated with each of the new projects proposed as part of this alternative. Stormwater retrofit of existing road surfaces associated with these new projects should be evaluated and carried out wherever practicable. The HOV-14 upgrade of Segment 9 of I-405 would present an opportunity for an early retrofit of this segment of the highway. It is a state goal to fully retrofit I-405 and other state highways in the project area by 2015. To the extent that this goal is achieved, there would be a substantial water quality benefit within the project area.

The overall operational impact of the No-Action Alternative upon surface water is judged to be below the threshold of significance.

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5.3 Alternative 1: HCT/TDM Emphasis

5.3.1 Construction Impacts

Under Alternative 1, six basins would have five or more projects constructed within their boundaries. Springbrook Creek would experience the highest number of projects (nine).

These projects would have the potential to temporarily degrade water quality during construction. Standard BMPs for control of erosion and other pollutants would be implemented during construction, as required by the *Western Washington Stormwater Management Manual*. These would minimize erosion and sedimentation to water bodies. However, several of the streams have the potential to suffer serious, short-term water quality degradation due to a combination of their sloping nature and the relatively high number of projects proposed for construction (five or more). These would include East Lake Washington, the Sammamish River and tributaries, and Forbes, Springbrook, North, and South Kelsey creeks. Wet weather construction within these basins could seriously degrade water quality. Substantial, short-term impacts could be avoided by implementing the wet-weather practices discussed in Section 5.8 (Mitigation Measures).

5.3.2 Operational Impacts

Alternative 1 would result in 305 acres of new impervious surface within the project area. This would represent a 0.2 percent increase in impervious area across the project area. The Springbrook Creek Basin would receive the most new impervious surface, 77 acres. Other basins receiving more than 15 acres of new impervious surface would include Sammamish River and Juanita, Forbes, South Kelsey, and North creeks and East Lake Washington Basin. The Lower Green and Duwamish rivers and Bear, Evans, Little Bear, and Swamp creeks would each experience less than 5 acres of new impervious surface. On a relative basis, Forbes Creek would experience the greatest impact, about 0.7 percent increase in impervious surface. Coal, South Kelsey, Juanita, and Springbrook creeks would experience an increase of 0.4 to 0.7 percent impervious surface.

The proposed road projects under this alternative would result in an increase in runoff to local drainage systems and streams. The standard detention requirements for new projects will be generally sufficient to avoid causing or intensifying downstream drainage or flooding problems. However, runoff detention will not fully offset the changes in hydrology due to increased runoff volumes. The reduction in pervious area and its associated groundwater recharge will increase the frequency of moderate (return intervals of 1 year, or less) stream flows and may result in a reduction in dry season base flows in several of the streams mentioned above. But given the small relative decreases in pervious surface likely to occur in any single basin, it is doubtful that any measurable reduction in base flow will occur.

Annual pollutant loads attributable to traffic along I-405 under Alternative 1 were calculated. It should be noted that pollutant load calculations were only carried out for conventional highway traffic along I-405. No attempt was made to estimate pollutant loads from the High Capacity

Transit (HCT) portion of this alternative. HCT would likely take the form of an electric light rail system. Although some pollutant loading could be expected from its right-of-way, it would be expected to be but a small fraction of that of the conventional highway.

Compared with the No-Action Alternative, Alternative 1 would generate slightly lower pollutant loadings along I-405. For instance suspended solids loading would be reduced by 2 tons. Other calculated pollutant load reductions are shown below:

- COD 163 ton
- Zinc 4,100 pounds
- Copper 430 pounds
- Total Nitrogen 3,800 pounds
- Total Phosphorus 1,700 pounds

In reality, these small reductions are computationally indistinguishable from those calculated for the No-Action Alternative. Thus the pollutant loadings estimated for Alternative 1 are essentially identical to those under the No-Action Alternative.

Stormwater treatment would be implemented for new impervious surfaces associated with each of the new projects proposed as part of this alternative. Stormwater retrofit of existing road surfaces associated with these new projects should be evaluated and carried out wherever practicable. In particular, the auxiliary lanes to be added to I-405 segments 1, 2, 4, 6, 7, and 8 would present an opportunity to retrofit most of I-405. It is a state goal to fully retrofit I-405 and other state highways in the project area by 2015. To the extent that this goal is achieved, there would be a substantial water quality benefit within the project area.

The overall operational impact of Alternative 1 upon surface water is judged to be below the threshold of significance.

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5.4 Alternative 2: Mixed Mode with HCT/Transit Emphasis

5.4.1 Construction Impacts

Under Alternative 2, five basins would have 10 or more projects constructed within their boundaries while an additional six basins would see between 5 and 10 projects. Springbrook Creek would experience the highest number of projects (16).

These projects would have the potential to temporarily degrade water quality during construction. Standard BMPs for control of erosion and other pollutants would be implemented during construction, as required by the *Western Washington Stormwater Management Manual*. These would minimize erosion and sedimentation to water bodies. However, several of the streams have the potential to suffer serious, short-term water quality degradation due to a combination of their sloping nature and the relatively high number of projects proposed for construction (five or more). These would include East Lake Washington, the lower Green, Cedar and Sammamish rivers and tributaries, and Springbrook, Swamp, Forbes, Juanita, South Kelsey, North, and Bear

creeks. Wet weather construction within these basins could seriously degrade water quality. Substantial short-term impacts could be avoided by implementing the wet-weather practices discussed in Section 5.8 (Mitigation Measures).

5.4.2 Operational Impacts

Alternative 2 would result in 641 acres of new impervious surface within the project area. This would represent a 0.5 percent increase in impervious area across the project area. The Springbrook Creek Basin would receive the most new impervious surface, 139 acres. Four other basins would receive more than 50 acres of impervious surface: East Lake Washington, Sammamish River, and South Kelsey and North creeks. The Duwamish River and Evans and Little Bear creeks would each experience less than 5 acres of new impervious surface. On a relative basis, South Kelsey Creek would experience the greatest impact, 1.8 percent increase in impervious surface. The Lower Green River, and Forbes, and Springbrook creeks would experience increases of 1 percent or greater of new impervious surface within their respective basins.

The proposed road projects under this alternative would result in an increase in runoff to local drainage systems and streams. The standard detention requirements for new projects will be generally sufficient to avoid causing or intensifying downstream drainage or flooding problems. However, runoff detention will not fully offset the changes in hydrology due to increased runoff volumes. The reduction in pervious area and its associated groundwater recharge will increase the frequency of moderate (return intervals of 1 year, or less) stream flows and may result in a reduction in dry season base flows. This would be especially true for those basins mentioned above with a 1 percent or greater increase in impervious surface. In particular, Springbrook Creek does not meet the water quality standard for temperature. Any substantial reduction in base flow could aggravate this situation.

Annual pollutant loads attributable to traffic along I-405 under Alternative 2 were calculated. It should be noted that pollutant load calculations were only carried out for conventional highway traffic along I-405. No attempt was made to estimate pollutant loads from the High Capacity Transit (HCT) portion of this alternative. For this alternative, HCT may take the form of an electric light rail system. Although some pollutant loading could be expected within its right-of-way, it would be expected to be but a small fraction of that of the conventional highway.

Approximately 566 tons of additional suspended solids would be generated along the entire length of I-405. Segment 3 would generate the highest load: 106 tons. Total additional annual loads (rounded) for other pollutants would be:

- COD 226 tons
- Zinc 7,800 pounds
- Copper 780 pounds
- Total Nitrogen 5,300 pounds
- Total Phosphorus 2,400 pounds

The above figures represent potential pollutant loading *before* stormwater treatment measures. Standard water quality treatment can reduce 80 percent of the suspended solids and COD and 40 to 60 percent of the metals and nutrients present in road runoff. As shown in Figure 3.1, there are a number of stormwater treatment facilities currently installed along I-405. Although their

effectiveness in reducing overall highway pollutant loads has not been quantified regionally, actual pollutant loadings to the surface waters in the project area would be lower than the figures shown above.

Stormwater treatment would be implemented for new impervious surfaces associated with each of the new projects proposed as part of this alternative. Under this alternative, upgrades are proposed along a number of the I-405 segments. Stormwater retrofit of existing road surfaces associated with these new projects should be evaluated and carried out wherever practicable. In particular, the auxiliary lanes to be added to I-405 segments 1, 2, 4, 6, 7, and 8 under this alternative would present an opportunity to retrofit most of I-405. It is a state goal to fully retrofit I-405 and other state highways in the project area by 2015. To the extent that this goal is achieved, quality benefits would result within portions of the project area.

In summary, this alternative would result in substantial increases in impervious surface area in three basins: South Kelsey, Forbes, and Springbrook creeks. (The fourth basin, Lower Green River, represents a very small portion of the much larger Green River Basin. The additional 34 acres of impervious surface would not be expected to measurably affect the river's base flow.) This could result in reductions in the base flows of these streams. This could also aggravate the temperature and heavy metals problems documented in Springbrook Creek. This alternative is, therefore, judged to have substantial impacts to surface water resources. However, with the mitigation measures proposed in Section 5.8, surface water impacts should be reduced to below the threshold of significance.

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5.5 Alternative 3: Mixed Mode

5.5.1 Construction Impacts

Under Alternative 3, three basins would have 10 or more projects constructed within their boundaries, while an additional seven basins would see between 5 and 10 projects. Springbrook Creek would experience the highest number of projects (14).

These projects would have the potential to temporarily degrade water quality during construction. Standard BMPs for control of erosion and other pollutants would be implemented during construction, as required by the *Western Washington Stormwater Management Manual*. These would minimize erosion and sedimentation to water bodies. However, several of the streams have the potential to suffer serious, short-term water quality degradation due to a combination of their sloping nature and the relatively high number of projects proposed for construction (five or more). These would include East Lake Washington, the Sammamish and Cedar rivers and tributaries, and Springbrook, Swamp, Forbes, Juanita, South Kelsey, North, and Bear creeks. Wet weather construction within these basins could seriously degrade water quality. Substantial, short-term impacts could be avoided by implementing the wet-weather practices discussed in Section 5.8 (Mitigation Measures).

5.5.2 Operational Impacts

Alternative 3 would result in 600 acres of new impervious surface within the project area. This would represent a 0.4 percent increase in impervious area across the project area. The Springbrook Creek Basin would receive the most new impervious surface, 104 acres. Four other basins would receive more than 50 acres of impervious surface: Sammamish River and South Kelsey and North creeks and East Lake Washington Basin. The Duwamish River and Kelsey, May, Evans, and Little Bear Creeks would each experience less than 5 acres of new impervious surface. On a relative basis, South Kelsey Creek would experience the greatest impact, a 1.6 percent increase in impervious surface. The Lower Green River would experience an increase of about 1 percent of new impervious surface.

The proposed road projects under this alternative would result in an increase in runoff to local drainage systems and streams. The standard detention requirements for new projects will be generally sufficient to avoid causing or intensifying downstream drainage or flooding problems. However, runoff detention will not fully offset the changes in hydrology due to increased runoff volumes. The reduction in pervious area and its associated groundwater recharge will increase the frequency of moderate (return intervals of 1 year, or less) stream flows and may result in a reduction in dry season base flows. This would be especially true for those basins mentioned above with a 1 percent or greater increase in impervious surface. In particular, Springbrook Creek does not meet the water quality standard for temperature. Any substantial reduction in base flow could aggravate this situation.

Annual pollutant loads attributable to traffic along I-405 under Alternative 3 were calculated. Approximately 694 tons of additional suspended solids would be generated along the entire length of I-405. Segment 3 would generate the highest load: 135 tons. Total annual additional loads (rounded) for other pollutants would be:

- COD 278 tons
- Zinc 1,600 pounds
- Copper 1,140 pounds
- Total Nitrogen 6,500 pounds
- Total Phosphorus 2,900 pounds

The above figures represent potential pollutant loading *before* stormwater treatment measures. Standard water quality treatment can reduce 80 percent of the suspended solids and COD and 40 to 60 percent of the metals and nutrients present in road runoff. As shown in Figure 3.1, there are a number of stormwater treatment facilities currently installed along I-405. Although their effectiveness in reducing overall highway pollutant loads has not been quantified regionally, actual pollutant loadings to the surface waters in the project area would be lower than the figures shown above.

Stormwater treatment would be implemented for new impervious surfaces associated with each of the new projects proposed as part of this alternative. Stormwater retrofit of existing road surfaces associated with these new projects should be evaluated and carried out wherever practicable. In particular, the lane additions proposed for all I-405 segments under Alternative 3 would present an opportunity to retrofit the entire length of I-405. It is a state goal to fully retrofit I-405 and other state highways in the project area by 2015. To the extent that this goal is achieved, quality benefits would result within portions of the project area.

In summary, this alternative would result in substantial increases in impervious surface area in one basin: South Kelsey Creek. This could result in reductions in the base flows of these streams. (The other basin, Lower Green River, represents a very small portion of the much larger Green River Basin. The additional 32 acres of impervious surface would not be expected to measurably affect the river's base flow.) This could also aggravate the temperature and heavy metals problems documented in Springbrook Creek. This alternative is therefore judged to have substantial adverse impacts to surface water resources. However, with the mitigation measures proposed in Section 5.8, surface water impacts should be reduced to below the threshold of significance.

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5.6 Alternative 4: General Capacity

5.6.1 Construction Impacts

Under Alternative 4, five basins would have 10 or more projects constructed within their boundaries, while an additional four basins would see between 5 and 10 projects. Springbrook Creek would experience the highest number of projects (15), followed closely by the Sammamish River Basin and North Creek, with 14 each.

These projects would have the potential to temporarily degrade water quality during construction. Standard BMPs for control of erosion and other pollutants would be implemented during construction, as required by the *Western Washington Stormwater Management Manual*. These would minimize erosion and sedimentation to water bodies. However, several of the streams have the potential to suffer serious short-term water quality degradation due to a combination of their sloping nature and the relatively high number of projects proposed for construction (five or more). These would include East Lake Washington, the Sammamish and lower Green rivers and tributaries, and Springbrook, Swamp, Forbes, Juanita, South Kelsey, and North creeks. Wet weather construction within these basins could seriously degrade water quality. Substantial short-term impacts could be avoided by implementing the wet-weather practices discussed in Section 5.8 (Mitigation Measures).

5.6.2 Operational Impacts

Alternative 4 would result in 888 acres of new impervious surface within the project area. This represents a 0.7 percent increase in impervious area across the project area. The South Kelsey Creek Basin would receive the most new impervious surface, 148 acres. Three other basins would receive more than 100 acres of impervious surface: East Lake Washington and North and Springbrook creeks. The Juanita Creek and Sammamish River basins would each receive between 50 and 100 acres of new impervious surface. The Duwamish River and Evans, Kelsey, Soos, and Little Bear Creeks would each experience less than 5 acres of new impervious surface. On a relative basis, South Kelsey Creek would experience the greatest impact, a 2.9 percent increase in impervious surface. Forbes, Springbrook, Juanita, and North creeks, and the Lower Green River and East Lake Washington basins would each experience increases of around 1 percent of new impervious surface.

The proposed road projects under this alternative would result in an increase in runoff to local drainage systems and streams. The standard detention requirements for new projects will be

generally sufficient to avoid causing or intensifying downstream drainage or flooding problems. However, runoff detention will not fully offset the changes in hydrology due to increased runoff volumes. The reduction in pervious area and its associated groundwater recharge will increase the frequency of moderate (return intervals of 1 year, or less) stream flows and may result in a reduction in dry season base flows. This would be especially true for those basins mentioned above with a 1 percent or greater increase in impervious surface. In particular, Springbrook Creek does not meet the water quality standard for temperature. Any substantial reduction in base flow could aggravate this situation.

Annual pollutant loads attributable to traffic along I-405 under Alternative 4 were calculated. Approximately 275 tons of additional suspended solids would be generated along the entire length of I-405. Segment 3 would generate the highest load: 62 tons. Total annual additional loads (rounded) for other pollutants would be:

- COD 310 tons
- Zinc 14,500 pounds
- Copper 1,410 pounds
- Total Nitrogen 7,300 pounds
- Total Phosphorus 3,300 pounds

The above figures represent potential pollutant loading *before* stormwater treatment measures. Standard water quality treatment can reduce 80 percent of the suspended solids and COD and 40 to 60 percent of the metals and nutrients present in road runoff. As shown in Figure 3.1, there are a number of stormwater treatment facilities currently installed along I-405. Although their effectiveness in reducing overall highway pollutant loads has not been quantified regionally, actual pollutant loadings to the surface waters in the project area would be lower than the figures shown above.

Stormwater treatment would be implemented for new impervious surfaces associated with each of the new projects proposed as part of this alternative. Stormwater retrofit of existing road surfaces associated with these new projects should be evaluated and carried out wherever practicable. In particular, the lane additions proposed for all I-405 segments under Alternative 4 would present an opportunity to retrofit the entire length of I-405. It is a state goal to fully retrofit I-405 and other state highways in the project area by 2015. To the extent that this goal is achieved, quality benefits would result within portions of the project area.

In summary, Alternative 4 would result in substantial increases in impervious surface area in six basins: East Lake Washington and South Kelsey, Forbes, Juanita, and North creeks. This could result in reductions in the base flows of these streams. (The seventh basin, Lower Green River, represents a very small portion of the much larger Green River Basin. The additional 40 acres of impervious surface would not be expected to measurably affect the river's base flow.) This could also aggravate the temperature and heavy metals problems documented in Springbrook Creek. This alternative is therefore judged to have substantial adverse impacts to surface water resources. However, with the mitigation measures proposed in Section 5.8, surface water impacts should be reduced to below the threshold of significance.

5.6.3 Secondary Impacts

Secondary impacts are reasonably foreseeable effects of an action that occur later in time or are further removed in distance from the direct effects of the proposal. Generally, these effects are induced by the initial programmatic action. Programmatic secondary impacts are expected to be limited and unlikely for the I-405 Corridor Program for several reasons:

- All of the I-405 Corridor Program action alternatives are generally compatible with existing regional and local land use plans that have already addressed growth.
- A similar level of projected growth is expected to occur in the region, with or without the action alternatives.
- Transportation projects, similar to I-405, are frequently built in response to population and/or employment growth.
- The I-405 Corridor Program study area is experiencing a high rate of population growth and land development that is increasing travel demand and congestion.

Secondary effects may be more detectable during project-level environmental analysis. Therefore, the potential for secondary effects will be analyzed in the future project-level environmental analysis, documentation, and review.

5.7 Cumulative Impacts

For further information on cumulative impacts, refer to Appendix I.

5.7.1 Past Conditions

The rivers and major lakes in the study area have been extensively altered due to development during the past century. For instance, in 1916 Lake Washington was lowered by 16 feet as a result of construction of a ship canal and locks to allow ship passage between Puget Sound and the lake. To assure adequate water for the newly constructed ship locks, the Cedar River was diverted into the south end of Lake Washington. Prior to this, the Cedar had flowed to the south of the lake and entered the Green River via the Black River. Today, the Black River is a very short stream and carries a small fraction of its former flow. The Green River lost another substantial source of water early last century when the White River (located just south of the study area) was permanently diverted south into the Puyallup River.

The riverbeds of both the lower Green River and the Sammamish River have been extensively lowered and channelized for flood control purposes. These rivers have lost the formerly extensive connection they once had with their respective floodplains and wetlands.

As development increased around Lake Washington in the 1950s, a number of sewage treatment plants were constructed and began discharging to the lake. By the 1960s, a definite trend in declining water quality was documented in the lake. Nutrient levels in the lake increased. Lake water clarity declined and nuisance algae blooms became a regular occurrence. The citizens in the region voted to create the Municipality of Metropolitan Seattle (Metro). During the 1960s, two large, regional sewage treatment plants were constructed and municipal wastewater discharges to Lake Washington were completely eliminated. Dramatic improvements in lake water quality

resulted. By the 1970s Lake Washington stood as a world-wide example of water quality restoration.

One of the two Metro wastewater treatment plants was constructed in Renton and initially discharged treated effluent to the Green-Duwamish River. This resulted in water quality problems (ammonia and dissolved oxygen) during periods of low flow. In the 1980s, a long outfall pipe was constructed to convey treatment plant effluent directly to Puget Sound. River quality improved as a result.

Much of the sewer system serving the older urban areas of Seattle carries both sanitary wastes and storm runoff. This type of system is termed a combined sewer system. During periods of heavy rainfall and runoff, the pipe capacity of some of these combined systems can be exceeded. When this happens, the system discharges excess, untreated sewage directly to water bodies. These combined sewer overflows occur primarily downstream of the study area, in the Duwamish River and Elliott Bay and along the ship canal, west of Lake Washington. Over the past several decades the local municipalities and Metro have installed a series of projects to eliminate or reduce the magnitude and frequency of combined sewer overflows. This program is scheduled to meet the state goal of one overflow event per year within the next decade.

The streams within the study area have also undergone considerable change. Most of the development within the stream basins has occurred in the past 50 years. There have been some declines in the quality of the streams. These include the typical pollutants associated with urban development: nitrogen, phosphorus, oil and grease, coliform bacteria, and detectable levels of some herbicides and pesticides. However, the more serious and pervasive effects upon streams have been physical. Direct stream impacts resulting from past development include bank armoring and widening for flood control. Local landowners have commonly cleared, armored, re-routed, or otherwise modified streams passing through their properties to achieve a variety of highly localized and uncoordinated effects. In the past, it was common practice to route a stream into an underground culvert for hundreds or even thousands of feet in order to pass under a highway or through a commercially valuable piece of real estate.

Many forested areas within the study area have been replaced by a high percentage of impervious area. Much of the riparian canopy has been removed, along with large instream wood. Streams now typically experience higher peak flows than they historically did. As a result, channel scouring and widening are common. Channel scour and bank erosion often lead to heavy sedimentation in low-gradient and downstream sections, particularly at stream mouths. Reduced infiltration in the basin reduces long-term water storage; summer streamflows are often considerably reduced, as well. Reduced forest canopy along many of the streams results in elevated summer stream temperatures.

By the 1970s there was recognition among the local municipalities that some form of stormwater controls for new development was needed. The Section 208 Areawide Wastewater Management Plans produced by King and Snohomish counties in the mid-1970s clearly demonstrated the deleterious effects that both urban and agricultural runoff were having on water quality. It was at this time that the concept of best management practices (BMPs) for control of stormwater runoff became well established. Some of the first stormwater utilities in the country were established in the central Puget Sound region, including Bellevue and King County. Stormwater detention, which limits increases in peak runoff that otherwise would result from new construction, began to be required in portions of the study area. The publishing of the landmark *Puget Sound Water Quality Management Plan* in the late 1980s gave further impetus to urban stormwater management.

In 1990, King County published its *Surface Water Design Manual*, which contained more stringent detention requirements and a requirement for stormwater treatment aimed at reducing suspended solids (sediment). In 1992, Ecology published the *Stormwater Management Manual for the Puget Sound Basin*. Stormwater detention and water quality treatment were mandated for all projects within areas draining to the Puget Sound Basin. In 1998, King County updated its stormwater management requirements. A higher level of stormwater management was prescribed for sensitive water bodies. Control of flow durations (not just peak flows) was now required. A higher level of water quality treatment was required for sensitive receiving waters. Ecology will publish a revised stormwater manual this year containing similar requirements. The new state stormwater management requirements will be extended to all of western Washington (i.e., that part of the state lying west of the crest of the Cascade Mountain Range).

Table 5.2 shows a simplified tabulation of the stormwater detention volume required for the development of 1 acre of forested land into 1 acre of impervious surface, such as a road, parking lot or rooftop. Prior to the early 1990s, there was no regional standard method for calculating detention. The then-commonly used detention calculation method was used for this exercise.

Table 5.2: Detention Volumes Typically Required in the Study Area Over the Past 25 Years

Timeframe	Geographic Coverage	Detention Volume[a] (cu ft)	Size of Typical 4-ft Deep Pond (sq ft)
Pre-1970s	Sporadic	Varied	Varied
1980s	King County, several cities	1,800	1,080
1990s	Puget Sound Basin	11,750[b]	3,950
2001 +	Western Washington	15,800	5,170

[a] Stormwater detention volume required for development of 1 acre of forested land into 1 acre of impervious surface

[b] 15,000 ft^3 with commonly applied safety factor

Within the past several decades, a number of regulatory programs have evolved that control stormwater and restrict direct disturbance of water bodies. The 1987 revisions to the Clean Water Act placed new emphasis on the requirement for larger cities and counties to obtain permits for stormwater discharges. (By 2003, Phase 2 of this program will require smaller municipalities to also obtain stormwater discharge permits, greatly expanding the federal requirements for stormwater management.) The 1990 Growth Management Act required cities and counties in the study area to, among other things, define, map, and protect (environment- and hazard-related) sensitive areas. This led to the establishment of buffers of various widths around streams, lakes, and wetlands. These buffers typically range from 25 to 100 feet from the edge of the stream or wetland. Within these buffers new development or disturbance is restricted. Where disturbance is unavoidable, mitigation may be required.

The State Department of Fish and Wildlife must issue a Hydraulic Project Approval (HPA) for any project that proposes to disturb any area within the ordinary high water mark of a stream or lake. These HPAs typically control the amount of allowable disturbance and set seasonal time limits to minimize interference with fish using the stream. They also contain requirements for restoration after construction and frequently attach mitigation requirements. Recent revisions to the State's Shoreline Management Act also restrict the level of disturbance or manipulation allowed along

the shores of the major marine and freshwater bodies. At the federal level, the U.S. Army Corps of Engineers often reviews projects for wetland effects or effects upon navigable waters under Section 404 of the Clean Water Act. Here too, restoration and mitigation requirements are typically placed upon projects where stream or wetland disturbance is unavoidable.

In March of 1999, the wild chinook salmon population within the Puget Sound basin was listed as "threatened" under the Endangered Species Act (ESA). A year later, Section 4D rules were published by the National Marine Fisheries Service which, among other things, dictate control of stormwater and protection of streams and lakes that form habitat for wild chinook. This has had the short-term effect of expanding federal review over many types of development formerly subject only to local review. It is likely that over the long term, modifications to the 4D Rule and the development of Habitat Conservation Plans will lead to a more streamlined approval process than is currently the case. It is clear that community land use plans and major development projects must specifically weigh potential impacts to streams and fish and be prepared to demonstrate adequate off-setting mitigation.

The bull trout has also been listed by the U.S. Fish and Wildlife Service. Other fish species are being considered, and it is likely that there will be additional listings in the future.

Numerous stream restoration projects have been constructed in virtually all of the streams within the study area and many more are planned. Many of these projects are funded by the local municipalities, either through direct capital improvement projects or through grants. An example of the latter is the King County Water Works Program, which has committed millions of dollars to local business and education partnerships for stream restoration projects. The state has been an important contributor through the Centennial Fund and the Salmon Recovery Board. The state Department of Fish and Wildlife and Department of Transportation have ongoing programs for culvert upgrades. The U.S. Army Corps of Engineers also has contributed substantially to restoration measures along the rivers and larger streams. The state is split into 62 large watersheds known as Water Resource Inventory Areas (WRIAs). The state is encouraging and funding watershed assessments for each of these WRIAs. WRIA studies are underway for WRIA 8 (Cedar-Sammamish [Lake Washington]) and WRIA 9 (Green-Duwamish), parts of which are within the I-405 corridor. Among other things, these studies will culminate in prioritized lists of stream and watershed restoration projects. This will help guide future federal, state, and local expenditures for stream restoration projects.

5.7.2 Future Trends

The regulatory programs briefly summarized above assure that the rate of hydrologic and water quality degradation in developing areas will be greatly reduced from those which historically occurred.

Low-impact development is an emerging approach for reducing the runoff impacts of development. This approach emphasizes narrow streets, efficient layout, dispersed runoff, and retention of a large percentage of undisturbed land (typically 65 percent). An alternative form of low-impact development is high-rise condominiums and mixed retail-residential developments that are appearing in the most densely developed areas of the study area: downtown Bellevue and Kirkland. By concentrating many residents in a small area, these types of development minimize additional impact upon stream basins. While effective in reducing the level of impact of urban development, it is not at all clear whether there is any set of practical measures that can entirely

avoid the hydrologic impacts of urban development. Research in the central Puget Sound region and elsewhere suggests that substantial stream impacts can occur with as little as 10 percent impervious area across a basin. This corresponds to about one house per 5 acres, a level associated with rural development.

Few of the regulatory programs discussed above address existing development. State and local stormwater regulations contain specific requirements for adding stormwater runoff controls to redevelopment of existing, developed areas. However there are also exclusions that are allowed. With few exceptions (state highways are notable exceptions), there are no requirements for the retrofit of stormwater controls to existing development. Given the relatively slow rate of large-scale redevelopment typical of existing urbanized areas and the difficulty of incorporating effective stormwater control measures in densely developed areas, it is unlikely that the hydrologic conditions of the urbanized portions of streams in the study area will greatly improve within the 2030 timeframe. With continued growth in the study area, it is likely that stream conditions in the I-405 corridor will continue to decline.

Future water resource conditions in the study area are difficult to predict with any accuracy. Stormwater regulations will undoubtedly continue to evolve. Two areas of evolution that seem reasonably assured are stricter treatment requirements for runoff from construction sites and more widespread application of proprietary stormwater treatment devices such as swirl concentrators and filters. With regard to the latter, there has, to date, been only limited experience in their application, regionally. As verifiable performance data become available and stormwater treatment requirements for targeted pollutants, such as nutrients and heavy metals, become more prevalent, installation of advanced stormwater treatment devices is likely to increase dramatically. Given their need for relatively high levels of maintenance, local stormwater utility budgets will rise as well.

There is a debate going on that may greatly affect long-term expenditures for stream and watershed protection. While a primary focus of these expenditures is restoring fish habitat, many projects also benefit the streams, themselves. Funds can be spent in an effort to restore degraded streams to their former hydrologic and water quality conditions. However, monies can also be spent to protect streams and the watersheds that currently support important fish runs. Easements or land purchases can be made to enhance buffers, protect sensitive areas, and preserve large portions of watersheds from future development. Which of these approaches (or possibly a hybrid) will emerge in the coming years is not possible to predict at this time. The basic strategy of watershed protection versus stream restoration will likely be heavily influenced by the National Marine Fisheries Service chinook recovery strategy, which is still several years from completion.

Large-scale inter-basin transfers of water are not common in this region. The use of Green River water by the City of Tacoma (which lies largely within or near the Puyallup River Basin) is a notable example, as is the Tolt River supply for the City of Seattle. Since the state long ago declared most of the rivers in the region fully-appropriated, inter-basin transfers have not been encouraged in recent decades. There are two inter-basin transfers currently under consideration. The recently formed Cascade Water Alliance is proposing to transfer water from the White River, immediately south of the project area, for municipal use among cities and water districts east and south of Lake Washington. A proposal for transfer of water from the Snoqualmie River Basin near North Bend has also emerged in recent years. As continued population increases in the region place pressure on existing water supplies, further proposals for inter-basin transfers will likely be made.

Municipal wastewater reuse, extensive in some arid portions of the country, has seen only limited application in the Puget Sound region. Both of the regional wastewater treatment plants discussed early in this section use only limited amounts of reclaimed water for local irrigation and some industrial use. This situation seems to be changing. A third regional wastewater treatment plant, called Brightwater, is proposed to be located somewhere within or near the northern portion of the study area, near the King-Snohomish county line. Substantial water reclamation is planned when this plant comes online in 2010. Other possible reclamation projects are under consideration. For instance, King County is considering a reclamation project to irrigate farms and a golf course in the Sammamish River Valley. It seems evident that water reuse will play a much larger future role in the regional water supply.

5.7.3 Cumulative Effects of I-405 Corridor Program Alternatives

The I-405 corridor is continuing to experience the rapid growth that is occurring throughout much of the central Puget Sound region. Between 2000 and 2020, the population within the corridor is projected to grow by more than 200,000. Households within the study area will increase by about 90,600 while employment will increase by about 128,400. Relatively large increases in households are projected in virtually all of the FAZs within the study area, so this analysis deals with general surface water impact across the entire study area. Several factors are used to convert these numbers into equivalent impervious surface area. A medium-low (average) housing density of four homes per acre with an impervious factor of 40 percent is conservatively assumed. Each new employee is assumed to occupy roughly 500 square feet of new impervious area. Employee building-occupancy typically falls within the range of 200-500 square feet per employee. The upper end of this range was adopted for this analysis and assumed to include access/parking area.

Application of the above factors yields an estimated increase of 9,500 acres of impervious surface associated with the projected new housing. The projected new employment would result in an estimated 1,500 acres of new impervious surface. Combined, the future growth in the study area is estimated to result in an additional 11,000 acres of new impervious surface. By comparison, the current impervious surface area within the study area is about 43,000 acres. Cumulative development, including the proposed I-405 Corridor Program improvements, would increase this to around 55,000 acres, a 28 percent increase. Overall, impervious area coverage in the study area would increase from the current 36 percent to 41 percent.

Even with implementation of stormwater detention and treatment measures for all new development, increases in pollutant loads and substantial changes in existing hydrology are likely to occur in many of the streams draining the I-405 corridor. In particular, reductions in seasonal base flows and associated increases in summer stream temperature may result. The cumulative effect upon water resources is therefore judged to be substantial and adverse.

The amount of new impervious area contributed by the I-405 Corridor Program ranges from 173 acres for the No-Action Alternative to 888 acres for Alternative 4. Thus the I-405 Corridor Program can be expected to contribute between 1 and 8 percent of the area's new impervious surface over the next 20 years.

The temperature and heavy metals impacts to Springbrook Creek (discussed in Section 4.3) are likely to be further aggravated due to other development occurring within this basin.

Alternative 1 would result in modest cumulative effects related to additional development in the following basins: Middle Swamp, Sammamish River, Juanita, East Lake Washington, Lower Cedar, Springbrook, and Upper Soos. The Bear and Kelsey creek basins would experience modest beneficial reductions in baseline development. Just beyond the project area boundaries, the Lower Soos Creek and Lower Issaquah creek basins would also experience reduced development, as would the drainages around Sea-Tac Airport.

Alternative 2 would influence a slight increase in pressure for growth in the same basins mentioned under Alternative 1, as well as in North Creek Basin.

Alternative 3 would contribute to substantially greater cumulative effects within the study area, compared to Alternatives 1 and 2. Pressure for additional growth would occur in the Juanita, Forbes, and Sammamish River basins. In the southern portion of the project area, the Lower Cedar and Soos Creek basins would also experience pressure for additional growth. Cumulative effects would also occur outside of the project area. The upper portions of North and Swamp creek basins, Upper Soos Creek Basin and the Green River, and the Lower White River south of Auburn would all experience modest additional pressure for growth. Pressure for minor additional growth would occur in the Lower Skykomish and Snohomish river basins within Snohomish County.

Basins experiencing decreased pressure for growth under Alternative 3 would be the same as mentioned under Alternative 1. The Bear and South Kelsey creek basins would experience modest reductions in pressure for growth. Just beyond the project area boundaries, the Lower Soos Creek and Lower Issaquah Creek basins would also experience reduced pressure growth, as would the drainages around Sea-Tac Airport. In addition, basins in central and western Seattle would experience somewhat lower levels of pressure for growth, as well as the City of Bremerton in Kitsap County. Given the relatively high level of existing development in these two cities, reduced levels of new pressure for growth are unlikely to translate into substantial changes in hydrologic conditions within the urbanized basins.

Cumulative effects on the basins under Alternative 4 would be similar to those under Alternative 3. Slightly higher pressure for growth effects would occur in the basins north and south of the project area. These include North and Swamp creek basins in the north and the Lower Green River, Soos Creek, and Lower White River basins in the south. Compared to Alternative 3, this alternative would further reduce pressure for growth in basins located in the Seattle area and the more populated portions of Kitsap County such as Bremerton. As stated earlier, these reduced growth pressure effects are not likely to result in substantial improvements in the current hydrologic conditions of these areas, given their relatively high degree of existing development.

The cumulative impact of additional growth forecast for the Project Area in Section 5.7 is greater, by more than an order of magnitude, than the direct impacts of the I-405 Program. This new development will generally be under the control of the local jurisdictions. The NPDES Phase 1 and 2 Programs, the Tri-County ESA Response, and the initiatives of the individual jurisdictions will be critical factors in addressing the significant hydrologic and aquatic habitat impacts that will result from future development. A combination of site-level and regional mitigation will probably be required to adequately address the large amount of new growth that the region faces. In addition, local agencies should consider changes to their development regulations that further protect natural stream processes and fish habitat.

5.8 Mitigation Measures

5.8.1 General Mitigation Measures

The following mitigations shall apply to all of the project alternatives.

Construction disturbance should be limited to the smallest area practical. In particular, natural, undisturbed areas should be disturbed at little as possible. Clearing activities shall be staged such that construction areas are cleared no later than 1 week ahead of the start of construction. If this is impractical, cleared areas shall be immediately mulched, covered with plastic or stabilized in an equivalent manner.

For any project constructed within 300 feet of a lake or stream, or where concentrated construction site discharge may flow directly to surface waters, all site grading and initial stabilization shall be scheduled to occur only during the dry season, April 1 through September 30. Where construction must occur within stream channels, such construction shall occur "in the dry," whereby streamflow is temporarily diverted around the work site. If other construction activities occur during the wet season, such as subgrade or pavement installation, utilities placement, or curbs and sidewalks, a plan shall be developed that:

- Limits disturbed area activities to a maximum of 48 hours at any single location
- Has provisions for temporarily ceasing construction and quickly stabilizing a site when rainfall greater than one-half inch in a 12-hour period is measured at the site.
- Uses alternative means for treating construction site runoff such as spray application or overland flow across a vegetated surface, or use of coagulants in the sediment ponds.

Grassed road embankments and biofiltration swales shall be utilized wherever practical to maximize treatment of road runoff.

Where new stream crossings are proposed, the design shall consider opportunities to minimize the number of crossings by measures such as co-siting together on-ramps and off-ramps.

Where water quality data indicate degraded conditions in the receiving waters, enhanced stormwater treatment will be considered.

Planning for all major road upgrade projects shall consider the practicality of retro-fitting existing impervious road surface areas for runoff detention and treatment. Where determined to be practicable, retrofit measures shall be budgeted into the road upgrade project.

Wherever soil tests and site conditions demonstrate the practicality, infiltration of treated stormwater shall be utilized.

Early in the design of specific projects, opportunities for regional treatment and detention shall be explored with adjacent municipalities.

Any new road crossings of streams shall be via a bridge spanning the 100-year floodplain unless a hydraulic analysis demonstrates that infringing abutments and/or bridge piers will not substantially change local high-water depths or velocities.

Disturbed riparian areas within road right-of-way shall be planted with native vegetation for a minimum width of 100 feet from each stream bank.

Pervious portions of the project area shall be treated with soil amendments, mulch, and vegetation to help absorb stormwater rather than discharge stormwater to surface waters.

All stormwater management facilities shall be located outside of stream, steep slope and wetland buffer areas.

Porous pavement/surfaces are encouraged, where appropriate (sidewalks, bike/footpaths and parking lots).

5.8.2 Alternative 1 Mitigation Measures

The eastern extension of the HCT to Issaquah lies within the Lake Sammamish Basin. Projects constructed within this basin will require special stormwater treatment (see Section 3.3.1) to reduce phosphorus.

5.8.3 Alternative 2 Mitigation Measures

Wherever soil tests and site conditions demonstrate the practicality, infiltration of treated stormwater shall be utilized. This mitigation is particularly applicable to those basins which may otherwise experience depletion of base flows:

- Springbrook: suitable soils in the western half of basin, west of SR 167
- South Kelsey: suitable soils scattered across one-quarter of the basin
- Forbes: suitable soils in the lower basin and along I-405

The eastern extension of the HCT to Issaquah lies within the Lake Sammamish Basin. Projects constructed within this basin will require special stormwater treatment (see Section 3.3.1) to reduce phosphorus.

Given the serious water quality problems in this basin, it is recommended that a comprehensive study be carried out for the Springbrook Creek Basin. This study should determine the impact of future development, including road projects, upon the hydrology and water quality of the stream. Measures to address the problems identified in this analysis may include emphasizing groundwater recharge of treated stormwater, flow augmentation, re-establishment of riparian zone vegetation and associated shading, and stormwater treatment to reduce heavy metals. The study shall identify stream improvements and stormwater management requirements necessary to achieve a net improvement in the temperature and heavy metal problems currently experienced by this stream.

With regard to the South Kelsey and Forbes basins, groundwater recharge of treated stormwater should definitely be emphasized in these basins. In addition, WSDOT and the affected

municipalities shall commit to projects benefiting the hydrology and habitat of these streams as measures to compensate for potential reductions in stream base flow resulting from proposed road improvements.

In lieu of within-basin mitigation, a WRIA-wide approach to mitigation of the program hydrologic impacts should be considered as a means to more cost-effectively address base flow impacts (see Section 6).

5.8.4 Alternative 3 Mitigation Measures

Wherever soil tests and site conditions demonstrate the practicality, infiltration of treated stormwater shall be utilized. This mitigation is particularly applicable to those basins which may otherwise experience depletion of base flows:

- South Kelsey: suitable soils scattered across one-quarter of the basin

With regard to the South Kelsey Basin, groundwater recharge of treated stormwater should definitely be emphasized in these basins. In addition, WSDOT and the affected municipalities shall commit to projects benefiting the hydrology and habitat of these streams as measures to compensate for potential reductions in stream base flow resulting from proposed road improvements.

In lieu of within-basin mitigation, a WRIA-wide approach to mitigation of the program hydrologic impacts should be considered as a means to more cost-effectively address base flow impacts (see Section 6).

5.8.5 Alternative 4 Mitigation Measures

A portion of Project R.CF.3 involves improvements to I-90 within the Lake Sammamish Basin. Projects constructed within this basin will require will require special stormwater treatment (see Section 3.3.1 to reduce phosphorus.

Wherever soil tests and site conditions demonstrate the practicality, infiltration of treated stormwater shall be utilized. This mitigation is particularly applicable to those basins which may otherwise experience depletion of base flows:

- Springbrook: suitable soils in the western half of basin, west of SR 167
- South Kelsey: suitable soils scattered across one-quarter of the basin
- East Lake Washington: Mostly upland, underlain by till; few suitable soils
- Forbes: suitable soils in the lower basin and along I-405
- Juanita: suitable soils in the middle and lower basins, west of I-405
- North: suitable soils in the central portion of the basin and along I-405

It is recommended that a comprehensive study be carried out for the Springbrook Creek Basin. This study should determine the impact of future development, including road projects, upon the hydrology and water quality of the stream. Measures to address the problems identified in this analysis may include emphasizing groundwater recharge of treated stormwater, flow

augmentation, re-establishment of riparian zone vegetation and associated shading and stormwater treatment to reduce heavy metals. The study shall identify stream improvements and stormwater management requirements necessary to achieve a net improvement in the temperature and heavy metal problems currently experienced by this stream.

Nearly 3 percent of the area of the South Kelsey Creek Basin would be converted to impervious surface under this alternative, the highest relative increase of any of the basins. A hydrologic study of the effects of future road and other development within the Kelsey Creek Basin appears warranted. This study can determine whether hydrologic changes, including flow depletions, are likely to result in water quality problems or further deterioration in fish habitat. Specific mitigations to adequately offset these impacts can then be identified and funded.

The impacts upon the remaining four basins appear to be less serious. Groundwater recharge of treated stormwater should definitely be emphasized in these basins. In addition, WSDOT and the affected municipalities shall commit to projects benefiting the hydrology and habitat of these streams as measures to compensate for potential reductions in stream base flow resulting from proposed road improvements.

In lieu of within-basin mitigation, a WRIA-wide approach to mitigation of the program hydrologic impacts should be considered as a means to more cost-effectively address base flow impacts (see Section 6).

6 SUMMARY AND CONCLUSIONS

This section summarizes the substantial potential surface water impacts among the five alternatives. An approach to regional (watershed) level mitigation is also outlined.

6.1 Summary of Project Impact

As part of design and construction, the detention requirements of the revised Stormwater Management Manual (Washington Department of Ecology, 2000) will be incorporated into each project under the I-405 Corridor Program. Therefore, this program will not result in any increases in peak stormwater flows or aggravation of downstream flooding. The three general types of impacts analyzed in Section 5 are:

- Impacts to water quality during construction
- Long-term reduction of stream base flow and associated changes in hydrology
- Long-term intensification of a water quality problem

The incremental changes in I-405 total annual pollutant loads were calculated for each of the four alternatives (refer to Figure 5.2 and Appendix D). Pollutant loads under Alternative 1 would not be materially different from those under the No-Action Alternative. Alternative 2 would generate from 40 to 80 percent higher pollutant loads, depending upon the parameter. Alternative 3 would generate from 70 to more than 160 percent greater pollutant loads, compared with the No-Action Alternative. Alternative 4 would generate the highest pollutant loadings. The loadings for this alternative would vary from about 90 percent to more than 220 percent higher than the No-Action Alternative. Using COD as an example, the No-Action Alternative is calculated to generate 154 tons per year, while Alternative 4 is estimated to generate an additional 310 tons per year, a 90 percent increase. For zinc, the calculated loadings are 4,200 and 14,500 pounds per year, respectively, a 245 percent increase.

Detention of project runoff would be accomplished as part of every new road or highway project as part of each alternative. Therefore, the I-405 Program would not be expected to aggravate existing drainage or flooding problems or cause substantial new drainage problems. However, the increased runoff volumes resulting from the project will result in hydrologic changes in some of the streams, as discussed below.

Table 6.1 identifies substantial surface water impacts, by basin, for each alternative. Impacts to water quality as a result of sediment and associated pollutants generated during construction would be the most common impact. This potential would exist within the East Lake Washington, Sammamish River, and Juanita, Forbes, North, Springbrook, and South Kelsey creek basins for all of the alternatives. The Swamp and Juanita creek basins could be similarly impacted under three of the alternatives.

No substantial operational impacts would be expected with either the No-Action Alternative or Alternative 1. Potentially substantial alterations in stream hydrology, including reductions in base flow, would be expected in South Kelsey Creek under the remaining three alternatives. Springbrook and Forbes creeks would be impacted under Alternatives 2 and 4, while substantial

hydrologic impacts to the East Lake Washington basin and North and Juanita creeks would be expected only under Alternative 4.

Substantial operational impacts to water quality were identified for Springbrook Creek under Alternatives 2 and 4. The temperature and heavy metals problems of this creek could be intensified by these alternatives. A hydrologic and water quality study of this stream should be carried out to quantify the direct and cumulative impacts upon this stream and to identify specific mitigations. Appropriate mitigations might include flow augmentation, acquisition and planting of riparian corridor, and treatment of stormwater runoff for metals.

The South Kelsey Creek Basin would experience the largest relative increase in impervious surface: nearly 3 percent under Alternative 4.

In terms of overall impact to surface water resources, the alternatives fall into three groupings. The No-Action Alternative and Alternative 1 would have the least impact. They would have the lowest amounts of new impervious surface and would not have any long-term substantial impacts to any of the basins. Although Alternative 3 would result in a similar amount of impervious area as Alternative 2, it would potentially impact just one basin, South Kelsey Creek. Alternatives 2 and 4 would generate the highest levels of impervious surface and could potentially impact three and six basins, respectively.

Table 6.1: Summary of Potentially Substantial Surface Water Impacts

Basin	Basic Impact	Alternative				
		1	2	3	4	No-Action
Bear Creek	Constr.		x	x		
	Ops. - Base Flow					
	Ops. - W.Q.					
Cedar River	Constr.		x	x		
	Ops. - Base Flow					
	Ops. - W.Q.					
Coal Creek	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					
Duwamish River	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					
West Lake Sammamish	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					
East Lake Washington	Constr.	x	x	x	x	
	Ops. - Base Flow				x	
	Ops. - W.Q.					
Evans Creek	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					

Forbes Creek	Constr.	x	x	x	x	
	Ops. - Base Flow		x		x	
	Ops. - W.Q.					
Juanita Creek	Constr.		x	x	x	
	Ops. - Base Flow				x	
	Ops. - W.Q.					
Kelsey Creek	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					
Lower Green River	Constr.		x			
	Ops. - Base Flow					
	Ops. - W.Q.					
Little Bear Creek	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					
Sammamish River	Constr.	x	x	x	X	
	Ops. - Base Flow					
	Ops. - W.Q.					
May Creek	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					
Basin	**Basic Impact**	**Alternative**				
North Lake Washington	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					
North Creek	Constr.	x	x	x	X	x
	Ops. - Base Flow				X	
	Ops. - W.Q.					
South Kelsey Creek	Constr.	x	x	x	X	
	Ops. - Base Flow		x	x	X	
	Ops. - W.Q.					
Soos Creek	Constr.					
	Ops. - Base Flow					
	Ops. - W.Q.					
Springbrook Creek	Constr.	x	x	x	X	
	Ops. - Base Flow		x		X	
	Ops. - W.Q.		x		X	
Swamp Creek	Constr.		x	x	X	
	Ops. - Base Flow					
	Ops. - W.Q.					

Constr.: Substantial construction impact to water quality
Ops. - Base Flow: Substantial operational impact to base flow
Ops. - W.Q.: Substantial operational degradation of water quality

6.2 Summary of Mitigation

Construction impacts can be largely avoided by limiting major clearing and grading to the dry season: April 1 through September 1. If other construction activities were to take place during the wet season, a special wet-weather erosion and sediment control plan would be prepared detailing additional requirements to provide adequate control and treatment of construction site runoff. These measures could include shortened intervals for ground-disturbing activities; ceasing of construction activities and rapid stabilization measures during and following storms greater than one-half inch in 24 hours; and additional treatment to remove suspended solids and turbidity from collected project site runoff prior to discharge.

A hydrologic study is recommended for Kelsey Creek, the most heavily impacted basin. This study would quantify the direct and cumulative project impacts upon this stream. And identify special stream mitigation measures if found to be needed. The impacts upon the remaining four basins appear to be less serious. Groundwater recharge of treated stormwater should definitely be emphasized in these basins. In addition, WSDOT and the affected municipalities shall commit to projects benefiting the hydrology and habitat of these streams as measures to compensate for potential reductions in stream base flow resulting from proposed road improvements

It is recommended that a comprehensive study be carried out for the Springbrook Creek Basin. This study should determine the impact of future development, including road projects, upon the hydrology and water quality of the stream. The study should identify stream improvements and stormwater management requirements necessary to achieve a net improvement in the temperature and heavy metal problems currently experienced by this stream.

6.3 Regional Mitigation

Mitigation is often most effective if it is "onsite and in-kind." Thus, unavoidable degradation of a stream riparian zone due to the construction of a new bridge may be most suitably mitigated through enhancements of that same riparian zone in the vicinity of the new bridge. It is WSDOT policy, at a minimum, to mitigate runoff impacts such that downstream flood damage and/or serious water quality problems are not increased as a result of new road projects. However, it is not always feasible to provide suitable mitigation, which fully mitigates all project impacts, adjacent to a project site, particularly in a highly developed urban area such as comprises much of the I-405 corridor. Thus, mitigation within the wider basin may become more beneficial and cost-effective. Basin-level mitigation measures, such as flow augmentation, infiltration, regional detention, stream habitat enhancement, and riparian acquisition, can be effective in offsetting and mitigating project impacts. As an example, Snohomish County has identified a number of acquisition projects in the North Creek Basin to protect and enhance the creek and its riparian zone. Similarly, the City of Bellevue is compiling a list of acquisition sites and habitat enhancement projects for Kelsey Creek. The Regional Watershed Analysis Program of King County has also identified stream enhancement projects within the impacted basins. As part of the WRIA 8 (Lake Washington) and WRIA 9 (Green-Duwamish River) programs, stream enhancement projects have been identified and prioritized on a river-basin-wide basis.

The State of Washington has developed interagency policy guidance for evaluating aquatic mitigation approaches, including regional mitigation. In general, regional mitigation may be considered when it will provide equal or better biological and other functional values compared to traditional onsite, in-kind mitigation. In making regulatory decisions, the agencies are instructed to "consider whether the mitigation plan provides equal or better functions and values, compared to existing conditions, for the target resources and species…" This policy guidance is reproduced in Appendix H.

It is recommended that the I-405 Program work closely with the National Marine Fisheries Service, the Washington Departments of Fish and Wildlife and Ecology, the Tribes, local municipalities, and basin stakeholders to develop a program of support for both local and regional stream enhancement projects. Projects that improve stream water quality and habitat, particularly those which would benefit ESA-listed species, such as bull trout and chinook salmon, should be identified and targeted for accelerated development supported by WSDOT. This support program should also incorporate the mitigation measures contained in the Fisheries and Wetlands Expertise Reports. The reader is referred to the Fish and Watershed Summary Report for further information on regional mitigation for the Program.

7 REFERENCES

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8 ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACHP	Advisors Council on Historic Preservation
ADA	Americans with Disabilities Act
ADT	Average daily traffic
AIRFA	American Indian Religious Freedom Act
APA	Aquifer Protection Area
APE	Area of potential effects
ARPA	Archaeological Resources Protection Act
B.P.	Before present
Bgs	Below ground surface
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe Railroad
CARA	Critical aquifer recharge area
CBD	Central business district
CEQ	Council on Environmental Quality
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
Cfr	Calculated fixed radius
COD	Chemical oxygen demand
CSCSL	Confirmed or Suspected Contaminated Sites List
CWA	Clean Water Act (Section 404)
DDES	King County Department of Development and Environmental Services
DEA	David Evans & Associates
DNR	Department of Natural Resources
DOH	Department of Health
Ecology	Washington State Department of Ecology
EIS	Environmental impact statement
EO	Executive Order
ESA	Endangered Species Act
ESA	Environmental site assessment
FAZ	Forecast and analysis zone
FHWA	Federal Highway Administration
FIRES	Finance, insurance, real estate, and other services
FTA	Federal Transit Administration
GIS	Geographic Information System
GMA	Groundwater Management Area
GP	General purpose
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
HCT	High-capacity transit
HOT	High-occupancy/toll
HOV	High-occupancy vehicle
HPA	High probability area (archaeologically sensitive area)

I/C	Interchange
ICR	Independent Cleanup Reports
ITS	Intelligent transportation system
IWG	Interagency Working Group on Environmental Justice
LQG	Large quantity generator
MOA	Memorandum of Understanding
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act of 1969
NFRAP	No Further Remedial Action Planned
NHPA	National Historic Preservation Act of 1966, as amended
NMFS	National Marine Fisheries Service
NPL	National Priority List
NRHP	National Register of Historic Places
OAHP	Office of Archaeology and Historic Preservation
OUM	Office of Urban Mobility (WSDOT)
PAHs	Polynuclear aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PSRC	Puget Sound Regional Council
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
ROW	Right-of-way
SCA	Sanitary Control Area
SCS	Soil Conservation Service
Section 106	National Historic Preservation Act, Section 106
Section 4(f)	Department of Transportation Act (23 USC, Section 138 – formerly 49 USC 1653(f))
SHPO	State Historic Preservation Officer
SPCC	Spill Prevention, Countermeasure, and Control
SQG	Small quantity generator
SSA	Sole source aquifer
TAZ	Transportation analysis zone
TCP	Traditional cultural property
TDM	Transportation demand management
THPO	Tribal Historical Preservation Officer
TSD	Treatment, storage, and disposal
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
WAC	Washington Administrative Code
WHPA	Wellhead Protection Area
WHPP	Wellhead Protection Program
WRHP	Washington Register of Historic Places
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation
WTCU	Wholesale trade, transportation, communication, and utilities

9 APPENDIXES

A. Major Element Descriptions

B. Alternatives and Projects Matrix

C. State Water Quality Standards

D. Pollutant Loading Calculations by I-405 Segment

E. Impervious Areas by Alternative and Basin

F. Communication and Coordination

G. Project Impact by Basin

H. State of Washington Alternative Mitigation Policy Guidance

I. Cumulative Impacts Background Information

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APPENDIX A
Major Elements of Alternatives

Appendix A
I-405 CORRIDOR PROGRAM
MAJOR ELEMENTS OF ALTERNATIVES

1. TRANSPORTATION DEMAND MANAGEMENT

TDM Package Core Assumptions

- Existing TDM programs will continue (public & private sector)
- Existing public TDM programs will be expanded to meet new market demand
- Implementation of trip reduction targets will be supported by new interlocal or sub-regional agreements
- Strategies are flexible, monitored and adjusted as needed over time (includes tracking trends for Internet, e-commerce)
- Funding is provided for demonstration projects, plus some ongoing funding for new TDM strategies found effective

Focus of TDM Package

SOV and other trip reduction through the use of:

- Incentives
- Increasing access to alternative modes
- Public information, education and promotion
- Land use strategies

Strategies in the TDM Package

VANPOOLING

- Maximize vanpooling in the corridor (minimum of a five-fold increase)
  - Intensive marketing of vanpooling, including start-up subsidies
  - Use of new “value-added" incentives (e.g., frequent flyer miles for vanpoolers)
  - Creation of a revolving no-interest loan fund for purchasing vans
  - 50% fare subsidy
  - Provide sufficient infrastructure (e.g., small park & ride lots)
  - Owner-operated vanpool promotion

PUBLIC INFORMATION, EDUCATION & PROMOTION PROGRAMS

- Establish ongoing public education and awareness program specific to the corridor (focus on issues and transportation alternatives)
- Provide traveler information system(s), including interactive ridematch and transit information
- Provide personalized trip planning assistance, including for transit

Strategies in the TDM Package
EMPLOYER-BASED PROGRAMS • Increase work choices Telecommuting, flextime, compressed work schedules, multiple shifts Proximate commuting (assigning employees to work sites close to home) Incentives to employers to offer work choices (e.g., tax credits) • For current commuter trip reduction program – new incentives and resources to help CTR-affected employers obtain CTR goals (e.g., grants, tax credits, staff support) • Expanded CTR-like program aimed at smaller employers plus those larger ones not affected by CTR laws (non-regulatory, voluntary based) • Support development and core operations of transportation management associations (TMA) • Parking cash-out program incentives and financing
LAND USE AS TDM Compact, mixed-use, non-motorized and transit friendly (re)development in target areas (urban centers, suburban clusters, key arterials, transit station areas, transit centers, park-and-ride lots) • Transit-oriented development (TOD) • Code changes, streamlining processes, local connectivity retrofitting projects to support (re)development • Programs (code assistance, design review support) to help jurisdictions and developers implement compact (re)development • New parking management programs
OTHER MISCELLANEOUS TDM PROGRAMS Innovative transit and vanpool fare media, incentives, demonstrations, matching funds, etc. [e.g., area-wide "Smart Card" (FlexPass) programs for Eastgate, downtown Bellevue, north Renton industrial area, Bothell business parks, Redmond, downtown Kirkland, Tukwila] • Non-commute trips TDM programs (research and demonstrations) • Other miscellaneous incentives (local and state tax credit programs, developer incentives)

2. EXPANDED TDM PACKAGE

Overview

This major element will include the range of regional pricing actions being evaluated by the PSRC. The potential impacts of the following actions will be examined in the context of the I-405 Corridor:

- Region-wide congestion pricing (RCP);
- Fuel taxes (revenue = RCP);
- Fuel taxes (revenue = 50% RCP);

- Mileage charge (revenue = RCP);
- Parking charges;
- High occupancy toll lanes.

2. NEW TRANSIT EXPANSION BY 50% WITHIN STUDY AREA

Transit service levels would be increased by 25% compared to the current King County 6-year plan, assumed to be in place by 2007.

Transit service levels would be increased by 50% compared to the current King County 6-year plan, assumed to be in place by 2007.

3. DOUBLE TRANSIT SERVICE WITHIN STUDY AREA

Overview

Transit service levels would be doubled compared to the current King County 6-year plan, assumed to be in place by 2007. The effects of I-695 on short-term transit service have not been assumed. Transit service coverage and design would also be revised to more closely match travel patterns within the study area. These revisions could include more center-to-center movements, connections between neighborhoods and centers, and development of an appropriate 'grid' transit system within the study area.

4. PHYSICALLY SEPARATED HIGH-CAPACITY TRANSIT (HCT)

Description

A high-capacity transit solution would be designed for the I-405 corridor. The exact technology of this solution would be determined in later studies, but could include busway, light rail, monorail, or similar mode that could operate at speeds of up to 70 mph. The HCT alignment would generally follow the I-405, SR 520 and I-90 freeway corridors in existing freeway, arterial, or railroad right-of-way. The key characteristic of this solution would be that it would have a dedicated alignment, removing it from congestion-induced delays. Bus service would be reconfigured to provide maximum accessibility to the HCT system.

Alternatives 1 and 2 assume a full-scale HCT within the corridor, likely using some form of rail technology. Alternative 3 assumes a bus rapid transit (BRT) concept, building on the existing freeway HOV system.

High Capacity Transit		
Jurisdiction	**Project ID***	**Projects**
Tukwila & Renton	T.HCT-1	HCT- SeaTac to Renton CBD
Renton	T.HCT-2	HCT-Renton CBD to NE 44th (Port Quendall)
Renton, Newcastle & Bellevue	T.HCT-3	HCT- NE 44th (Port Quendall) to Factoria
Bell & Issaquah	T.HCT-4	HCT – Factoria to Issaquah

High Capacity Transit		
Bellevue	T.HCT-5	HCT – Factoria to Downtown Bellevue
Bell & Redmond	T.HCT-6	HCT – Bellevue to Redmond
Bell & Kirkland	T.HCT-7	HCT – Bellevue to Totem Lake
Kirk, King Co. & Woodinville	T.HCT-8	HCT – Totem Lake to Bothell
Bothell & Sno Co.	T.HCT-9	HCT – Bothell to Lynnwood

High Capacity Transit Stations	
Sea-Tac	Sea-Tac
Tukwila	Southcenter
Tukwila & Renton	Tukwila (Longacres)
Renton	Downtown Renton
Renton	North Renton
Renton	Port Quendall
Bellevue	Factoria
Bellevue	Bellevue Transit Center
Bellevue	Bellevue Library
Bell & Kirk	SR 520/Northup Way
Kirkland	Downtown Kirkland (NE 85th Street)
Kirkland	Totem Lake
Woodinville	NE 145th Street
Woodinville	Woodinville
Bothell	NE 195th Street
Bothell	Canyon Park
Snohomish County	164th Street SW (Ash Way)
Bellevue	Eastgate
Bellevue	Lakemont
Issaquah	Issaquah
Bellevue	132nd Avenue NE
Bellevue	148th Avenue NE
Redmond	Overlake (NE 40th Street)
Redmond	Redmond/Town Center
Redmond	Bear Creek
Mercer Island	Mercer Island

6. ADD ARTERIAL HOV AND TRANSIT PRIORITY

Overview

Create lanes, intersection queue jumps and signals that provide priority to HOVs and transit on major arterials in the study area.

Arterial HOV		
Bellevue	R.HOV-36	Coal Creek Pkwy I-405 to Forest Drive
Bellevue	R.HOV-37	NE 8th Street I-405 to 120th Ave NE
Kirkland, Redmond	R.HOV-38	NE 85th St Kirkland Way to 148th Ave NE
Kirkland	R.HOV-39	NE 116th 98th Ave NE to 124th Ave NE
Kirkland	R.HOV-40	NE 124th 100th Ave NE to 132 Ave NE
Bothell	R.HOV-41	SR 527 From SE 228th St to SR 524
Renton	R.HOV-43	SR 169 - SR 405 to Riverview Park vicinity - HOV/Transit Preferential treatment.
Renton	R.HOV-44	SW 27th St Corridor in Renton - Oaksdale Ave to SR 167
Redmond	R.HOV-47	Avondale Rd from Novelty Hill Road to Avondale Way Construct SB HOV lane
Renton, King Co	R.HOV-48	SW 43 St (SR 167 to 140 Ave SE)
Renton	R.HOV-49	Logan Ave N / N 6 St (S 3 St to Park Dr)
Renton	R.HOV-51	Park Dr - Sunset Blvd (Garden Ave to Duvall Ave NE)
Kenmore	R.HOV-53	68 Ave NE (Smds Rd to SR 522) - Construct NB HOV lane
Redmond	R.HOV-55	Willows Rd (Redmond Wy to NE 124 St)
Kirkland, Bell	R.HOV-56	Lake Wa Blvd (SR 520 to Yarrow Bay) - SB HOV lane
Kirkland	R.HOV-57	NE 68 St/NE 72 Pl (I-4405 Vicinity) – Que Bypass
Bellevue	R.HOV-60	Bellevue Way - I-90 to South Bellevue Park and Ride

7. HOV EXPRESS ON I-405 WITH DIRECT ACCESS RAMPS

Overview

Complete the series of ramps connecting arterials and freeways directly to HOV lanes on I-405. This allows carpools, vanpools and buses to use the HOV lanes without weaving across other traffic. HOV direct access ramps have already been designed by Sound Transit in downtown Bellevue and Kirkland, and design studies are starting for HOV ramps in downtown Renton.

HOV Interchange Ramps (Direct Access)		
Tukwila	R.HOV-25	SR 5 I/C @ Tukwila Fwy to Fwy HOV ramps,
Renton	R.HOV-26	SR 167 I/C Fwy to Fwy HOV ramps,
Bellevue	R.HOV-27	SR 90 I/C Fwy to Fwy HOV ramps,
Bellevue	R.HOV-28	SR 520 Fwy to Fwy HOV ramps,
Bothell	R.HOV-29	SR 522 Fwy to Fwy HOV Ramps
Sno. Co.	R.HOV-30	SR 5 I/C @ Swamp Creek Fwy HOV ramps.
Kirkland	R.HOV-61	NE 85th
ST	R.HOV-101	I-405 @ Lind – HOV Direct Access
Newcastle	R:HOV-65	112th St SE (In-Line Station)

Committed HOV Projects		
Bellevue	HOV-01	I-405 at NE 4th/6th/8th (Bellevue)/Construct new HOV direct access at NE 6th, Improve arterial capacity at NE 4th/8th interchanges
Bellevue	HOV-02	I-90 (Eastgate)/New I-90 HOV direct access connection to P&R
Renton	R.HOV-32	Between Sunset and SR-900 /Park Ave interchange in Renton
ST	R:HOV-66	I-405 at 128th St/HOV direct access improvements
Renton	R.HOV-33	NE 44th I/C - HOV Direct Access and Arterial Improvements(Assumes Port Quendall)
WSDOT	HOV-14	I-405 (I-5 Swamp Creek to SR 527)/Construct NB and SB HOV lanes total 6 lanes
Bothell	R.HOV-62	SR 522 Campus Access
Bothell	R.HOV-63	SR 527 Flyer Stop
ST	HOV-102	Woodinville Arterial Enhancements/HOV arterial enhancements

8. ADD PARK-AND-RIDE CAPACITY TO MEET DEMAND

Overview

Provides additional park-and-ride capacity at existing locations and creates selected new lots based on forecasted transit and carpool demand. The locations initially identified for expansion are listed below. These locations will be refined during the evaluation process.

Park and Rides		
Renton	T.PR-3	Renton East Highlands new Park and Ride
Tukwila & Renton	T.PR-6	Tukwila Commuter Rail (Longacres)
King County	T.PR-5	140th Ave SE and Petrovitsky Rd Vicinity
King County	T.PR-8	SR 169 and 140th WY SE
King County	T.PR-9	Petrovitsky Rd and 157th Ave SE
King County	T.PR-10	140th Ave SE and SE 192nd
King County	T.PR-11	SR 515 and SE 208th
Kent & Renton	T.PR-12	SR 167 and SW 43rd
Kent & Renton	T.PR-13	SR 167 and 84th Ave
Redmond	T.PR-17	Willows Rd @ NE 100th
Redmond	T.PR-18	SR 202 @ NE 100th
Bellevue & Kirkland	T.PR-20	South Kirkland
Redmond	T.PR-21	Overlake
Bellevue	T.PR-22	South Bellevue
Bellevue	T.PR-23	Newport (112th Ave. SE)
King County	T.PR-24	NE 160th/Brickyard Rd
Bothell	T.PR-25	Canyon Park (I-405 and SR 527)
Tukwila	T.PR-30	Tukwila
Kirkland	T.PR-31	Houghton
Kirkland	T.PR-32	Kingsgate
Medina	T.PR-33	Evergreen Point
Bellevue	T.PR-34	Wilburton
King County	T.PR-35	Lakemont
Redmond	T.PR-36	Redmond
Redmond	T.PR-37	Bear Creek
Bothell	T.PR-38	Bothell
Kenmore	T.PR-39	Northshore
Kenmore	T.PR-40	Kenmore
Woodinville	T.PR-41	Woodinville
Mercer Island	T.PR-42	Mercer Island
Bellevue	T.PR-43	Eastgate

9. ADD TRANSIT CENTER CAPACITY TO MEET DEMAND

Overview

Expand existing transit centers and create new transit centers to accommodate increased transit service. The specific locations for expansion and new centers will be identified during the evaluation process. Alternatives 1, 2, and 3 will require transit center capacity to accommodate a significant increase in transit service, at designated HCT stations, and at feeder bus connections. A partial listing is below.

Transit Center Capacity		
Renton	T.TC-6	Downtown Renton
Bellevue	T.TC-8	Downtown Bellevue
Redmond	T.TC-9	Overlake
Redmond	T.TC-10	Redmond/Town Center
Kirkland	T.TC-12	Downtown Kirkland
Kirkland	T.TC-14	Totem Lake

10. BASIC I-405 IMPROVEMENTS

Overview

This major element fixes existing bottlenecks and locations with safety deficiencies along I-405.

Basic I-405 Improvement Projects		
Jurisdiction	**Project ID***	**Projects**
Renton	R.BI.1	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167
Kirkland	R.BI.2	Continue NB climbing Lane from NE 70th to NE 85th and continue as auxiliary Lane to NE 116th
Kirkland	R.BI.3	SB auxiliary Lane NE 124th to NE 85th
Bellevue	R.BI.4	I-90 / Coal Creek Interchange
Bothell, King Co, Kirkland	R.BI.5	SB SR 522 to 124th continue climbing lane as an auxiliary lane
Bothell	R.BI.6	NB auxiliary lane SR 522 to SR 527
Renton	R.BI.7	Kennydale Hill climbing lane - SR 900 to 44th - NB 900 to 30th, SB 44th - 30th
Bellevue	R.BI.8	I-90 to Bellevue SB HOV direct connection to I-90 west
Bellevue	R.BI.9	NB auxiliary lane I-90 to NE 8th
Bellevue	R.BI.10	Increase SR 405 to Eastbound SR 520 Ramp capacity
Renton	R.BI.14	NB Auxiliary Lane I-5 to SR 167
Various	R.FR-24	Improve interchange geometrics at all major truck routes (WB-20 Design Criteria)
WSDOT	R-55	I-405/SR 167 Interchange/Construct new southbound I-405-to-southbound SR 167 ramp modification.

11. ADD 2 GENERAL PURPOSE LANES EACH DIRECTION ON I-405

Add up to 2 general purpose lanes to I-405 through widening of the existing freeway. A design option is to create collector-distributor lanes in selected corridor segments (See Element 12).

12. PROVIDE COLLECTOR DISTRIBUTOR LANES ON I-405

Overview

Collector- Distributor lanes provide more time for traffic to safely enter or exit from roadway by providing lanes removed from general travel. This is being considered as a design option to handle the addition of one or two general purpose lanes in each direction along I-405 in certain sections. Collector-Distributor lanes have been included as parts of other elements.

13. ADD TWO EXPRESS LANES EACH DIRECTION ON I-405

Overview

This element consists of a four-lane express facility designed to operate with limited interchanges along the length of I-405. The express lanes would be physically separated from the rest of I-405 through the use of barriers. Certain segments could operate within the median of I-405, while other segments would need to be elevated, in tunnel, or on separate alignments.

The express lanes could operate as a general purpose facility or as a managed facility, such as a 'High Occupancy Toll (i.e. HOT) lane. Certain users could be allowed to use the express lanes for free, while other users could be allowed to 'buy-in' to available capacity. The capacity would be priced depending upon demand.

Express Lanes – 2 Lanes each Direction between Major Interchanges		
Jurisdiction	**Project ID**	**Projects**
Tukwila, Renton	R.TC-20	Add Express lanes - SR 5 Tukwila to SR 167
Renton	R.TC-21	Add Express lanes - SR 167 to SR 900 north Renton I/C
Renton, Newcastle, Bellevue	R.TC-22	Add Express lanes -SR 900 North Renton I/C to SR 90
Bellevue	R.TC-23	Add Express lanes - SR 90 to SR 520
Bellevue, Kirkland	R.TC-24	Add Express lanes - SR 520 to NE 70th
Kirkland	R.TC-25	Add Express lanes - NE 70th to NE 124th
Kirkland, King County, Bothell	R.TC-26	Add Express lanes - NE 124th to SR 522
Bothell	R.TC-27	Add Express lanes - SR 522 to SR 527
Bothell and Snohomish Co.	R.TC-29	SR 527 to vicinity of Damson Road
Renton	R.TC-28	Add Express lanes- on SR 167 north of 180th up to I-405

Express Lanes –Access Locations		
Snohomish Co	R.TC-30	Northern end to Express lanes - Between SR 527 and I-5
King Co/Kirkland	R.TC-31	Slip Ramp- South of NE 160th St
Kirkland	R.TC-32	Slip Ramp- South of NE 70th St
Bellevue, Newcastle	R.TC-33	Slip Ramp- South of Coal Creek Pkwy
Renton	R.TC-34	Interchange access location- SR 167

14. WIDEN SR 167 BY 1 LANE EACH DIRECTION TO KENT (STUDY AREA BOUNDARY)

Overview

SR 167 would be widened by one lane in each direction to accommodate additional demands due to growing demands and the effects of improvements at the I-405/SR 167 interchange. The widening is assumed to extend at least to the study area boundary in Kent. Alternative 3 will consider the potential to add a total of two lanes in each direction to SR 167 within 1 mile of I-405, due to the substantial capacity additions assumed for I-405. This element does not presume that SR 167 would be redesignated as I-405, although each of these improvements would be compatible with such a redesignation if it occurs.

16. IMPROVE CONNECTING FREEWAY CAPACITY TO I-405

Overview

Enhance the capacity of connecting freeways by one lane in each direction (for a distance of approximately ½ to 1 mile on both sides of I-405) to avoid bottlenecks at the connections to I-405.

Connecting Freeway Capacity (One Lane, Each Direction)		
Jurisdiction	**Project ID**	**Projects**
Tukwila	R.CF.1	SR 518 I-405 to SR 99/Airport Access
Bellevue	R.CF.3	I-90 South Bellevue to Eastgate
Bellevue	R.CF.4	SR 520 Bellevue Way to 148th Avenue NE
Bothell, Woodinville	R.CF.5	SR 522 Bothell to NE 195th
Snohomish Co, Lynnwood	R.CF.6	SR 525 I-405 to SR 99
Renton, Kent	R.CF.8	SR 167 I-405 to Study Area Boundary
Tukwila	R.CF.9	I-5 at Tukwila
Lynnwood	R.CF.10	I-5 at Swamp Creek – 196th to 164th

17. IMPLEMENT PLANNED ARTERIAL IMPROVEMENTS

Overview

This major element involves the implementation of several arterial improvements called for in local agency plans and the Eastside Transportation Program (ETP). The ETP has been an ongoing process by regional, county and local governments to coordinate transportation planning and funding in East King County. Many of the ETP projects have already been examined in detail by the agencies involved and have been determined to be effective in addressing a variety of transportation issues.

Eastside Transportation Projects - Committed Projects		
Jurisdiction	**Project ID**	**Projects**
Bellevue	R-08	NE 29th Pl (148th Ave NE to NE 24th St)/Construct new 2-lane road
Bellevue	R-101	150th Ave SE---Widen to 7 lanes from SE 36th to SE 38th; add turn lanes
KCDOT	R-40	Juanita-Woodinville Way (NE 145 St to 112th Ave NE) Widen to 5 lanes + CGS, walkway/pathway
KCDOT	R-47	NE 124 St (Willows Rd to SR 202)--- Widen to 4/5 lanes + CGS, bike facilities; traffic signal.
Kirkland	R-21	NE 120 St (Slater Ave to 124 Ave NE)--- Construct new 3-lane roadway with ped/bike facilities
Redmond	R-111	Willows Rd Corridor Improvements-- Channelization of Willows Rd/Redmond Way intersection and widening of Willows Rd from NE 116th to NE 124th
Redmond	R-26	NE 90 St (Willows Rd to SR 202)--- Construct new 4/5 lanes + bike facilities
Redmond	R-28	West Lake Sammamish Parkway (Leary Way to Bel-Red Rd)--- Widen to 4/5 lanes + CGS, bike lanes
Renton	R-36	Oakesdale Ave SW (SW 31st to SW 16th)--- Construct new 5 lane roadway with CGS
Snohomish Co.	R-10	SR 524 (24 St SW to SR 527)--- Widen to 4/5 lanes including sidewalks, bike lanes
Snohomish Co.	R-117	39th Ave SE Realignment at SR 524 and York Rd--- Construct 4-way intersection to replace 2 offset intersections
Bothell, Snohomish Co.	R.AC-21	120th NE/39th SE - NE 95th to Maltby Rd - 4/5 lanes including new connection
Woodinville	R-51	Woodinville-Snohomish Rd/140 Ave NE (NE 175 St to SR 522)--- Widen to 4/5 lanes + CGS, bike lanes
Woodinville/ WSDOT	R-25	SR 202 Corridor Improvements(East Lake Sammamish Pkwy to Sahalee Way)--- Widen to 3/5 lanes; intersection improvements with bike/ped facilities
KCDOT	R-39	140 Ave SE (SR 169 to SE 208 St)--- Widen to 5 lanes SR 169 to SE 196 St, widen for turn channels on SE 196. Combines 2 King County CIP projects. A major North-South arterial which serves the Soos Creek Plateau and Fairwood.

Eastside Transportation Projects - Planned Projects		
Jurisdiction	**ETP #**	**Projects**
Bellevue	R.PA-2	148 Ave SE (SE 24 St to SE 28 St) New SB lane from SE 24 St to the WB I-90 on-ramp (ETP 203)
Bothell	R.PA-3	SR 522 Multimodal Corridor Project--- Widen SR-522 mostly within existing ROW to provide transit lanes, safety improvements, consolidated driveways & left turn lanes; and sidewalks. (ETP R-107)
Bothell	R.PA-4	SR 524 (SR 527 to Bothell City Limit)--- Widen to 5 lanes + CGS, bike facilities (class III) (ETP R-11)
KCDOT	R.PA-5	SE 212 Way/SE 208 St (SR 167 to Benson Rd/SR 515)--- Widen to 6 lanes + bike facilities, Transit/HOV preferential treatment, turn channels. (ETP R-46)
KCDOT	R.PA-8	NE 124/128 St (SR 202 to Avondale Rd)--- Widen to 4/5 lanes including bike & equestrian facilities (ETP 164)
KCDOT	R.PA-10	NE 132 St Extension (132 Ave NE to Willows Rd Ext.)---- Construct new 3 lane arterial with CGS, bike lanes (ETP 61)
Kenmore/KCDOT	R.PA-11	68 Ave NE (Simonds Rd to SR 522)--- Construct NB HOV lane total of 5/6 lanes (ETP 22)
Kirkland	R.PA-12	124 Ave NE (NE 85 St to Slater Rd NE)---- Widen to 3 lanes (s. of NE 116th St, 5 lanes n. of NE 116th St with ped/bike facilities (ETP R-23)
Kirkland	R.PA-13	NE 132 St (100 Ave NE to 116 Way NE)--- Widen to 3 lanes + CGS, Bike lane (ETP R-124)
Kirkland	R.PA-14	NE 100 St (117 Ave NE to Slater Ave) --- Construct bike/pedestrian/emergency Vehicle overpass across I-405 (ETP 309)
Newcastle	R.PA-15	Coal Creek Pkwy (SE 72 St to Renton City Limits)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signals (ETP R-24)
Redmond	R.PA-16	Redmond 148th Ave NE Corridor - 3 projects--- Turn lane and channelization improvements along corridor – BROTS; (ETP R-112)
Redmond	R.PA-17	Bear Creek Pkwy--- Construct new 162nd Ave NE arterial and new 72nd St arterial w/ bike/ped and CSG; widen Bear Creek Pkwy (ETP R-110)
Redmond	R.PA-18	Union Hill Rd (Avondale Rd to 196 Ave NE)--- Widen to 4/5 lanes with bike facilities (ETP R-27)
Renton	R.PA-19	Duvall Ave NE (NE 4 St to NE 25 Court -City Limits)--- Widen to 5 lanes + CGS, bikeway (ETP R-31)
Renton	R.PA-20	Oakesdale Ave SW (Monster Rd to SR 900) Replace Monster Rd Bridge; widen to 4/5 lanes +Bike Lanes + CGS (ETP R-35)
Renton	R.PA-21	Rainier Ave / Grady Way (intersection)-- Grade separation (ETP R-33)

Eastside Transportation Projects - Planned Projects		
Renton	R.PA-22	SW Grady Way (SR 167 to SR 515)-- Rechannelize and modify signals for a continuous eastbound lane (ETP R-37)
Renton	R.PA-23	SR 167 at East Valley Road--- New southbound off-ramp and signalization at East Valley Road (ETP 255)
Renton/ KCDOT	R.PA-24	Soos Creek Regional Links --- Placeholder for Trans-Valley Study (ETP R-115)
Woodinville	R.PA-25	SR 522 Interchange Package(SR 522/SR 202 &SR522/195th St))-- Access improvements and new freeway ramps (ETP R-53) (See R.AC-30)
Woodinville	R.PA-26	SR202 Corridor Package (SR202/148th Ave & SR202/127th Place)--- Intersection improvements (ETP R-54)
WSDOT	R.PA-27	SR 520/SR 202 Interchange-- Complete interchange by constructing a new ramp and thru lane on 202 to SR 520 (ETP R-29)
WSDOT	R.PA-28	SR 202 / 140 Place NE (NE 124 St to NE 175 St)--- Widen 4/5 lanes (ETP R-43) (See R.AC-17, 18)

18. EXPAND CAPACITY ON NORTH-SOUTH ARTERIALS

Overview

This element expands arterial capacity to provide connected north-south travel. This element would facilitate vehicular movement without requiring as many trips along I-405.

North-South Arterial Projects		
King Co	R.AC-2	138th Ave - Petrovitsky Rd to SR 169- Add 1 lane
King Co, Renton	R.AC-3	138th Ave SE - Construct roadway link to 4/5 lanes- SR 169 to NE 4th St
Redmond	R.AC-15	Willows Rd- NE 90th St to NE 124th St- Add 1 lane each direction
King Co, Woodinville	R.AC-16	Willows Rd- NE 124th St to NE 145th St- construct new facility -4/5 lanes
Woodinville	R.AC-17	SR 202- NE 145th St to SR 522- widen to 5 lanes
Redmond, King County, Woodinville	R.AC-18	SR 202 - NE 90th to NE 145th
Bothell, Snohomish County, Mill Creek	R.AC-20	SR 527/Bothell Everett Hwy - SR 522 to SR 524 - Widen by 1 lane each direction
Bothell, Woodinville	R.AC-30	SR 202 connection across SR 522 to 120th
Tukwila	R.AC-35	SR 181- S 180th to S 200th
Tukwila	R.AC-36	SR 181- 144th to Strander Blvd.
Tukwila	R.AC-37	Southcenter Blvd - Tukwila Pky to Strander Blvd

19. UPGRADE ARTERIAL CONNECTIONS TO I-405

Overview

This element provides for upgrading arterial connections to I-405. These projects are intended to improve operations at on- and off-ramps as well as on the arterials themselves. An additional lane in each direction was assumed for these arterials, although further analysis may show that similar benefits could be achieved through selected intersection improvements in some cases.

Arterial Interchange Improvements (One Lane Each Direction)		
Jurisdiction	**Project ID**	**Projects**
Tukwila	R.IC-3	SR 181 West Valley Highway/ Interurban
Renton	R.IC-4	SR 169 Maple Valley Hwy SR 900 to NE 5th
Bellevue	R.IC-6	Coal Creek Pkwy I-405 to Factoria Blvd.
Kirkland, Redmond	R.IC-8	NE 85th St-Kirkland Way to 124th
Kirkland	R.IC-9	NE 116th- 114th Ave NE to 124th Ave NE
Kirkland	R.IC-10	NE 124th- 113th Ave NE to 124th Ave NE
Kirkland	R.IC-26	NE 132nd - 113th to 124th Ave NE
Bothell	R.IC-11	SR 527-228th to SR 524
Kirkland, King Co	R.IC-14	New half diamond interchange to/from north at NE 132nd St
Bothell	R.IC-21	New SR 405 Interchange at 240th Street SE(Bothell)
Bothell	R.IC-24	NE 160th Street-112th Ave to Juanita/Woodinville Way

21. CORRIDOR PEDESTRIAN AND BICYCLE IMPROVEMENTS

Overview

Non-motorized improvements throughout the corridor provide needed connections between modes (e.g. pedestrian overpasses from park and rides to freeway bus stops) and allow for commutes or trips to be made by walking or biking. Alternative 3 will exclude all of the 'long-distance' trails (identified below under the heading Pedestrian/Bicycle Connections) from this element. These improvements need further refinement in the context of other major elements in the alternatives.

Pedestrian/Bicycle (I-405 Crossings)		
Bellevue	NM. CR-1	Lk Washington Blvd/112th Ave. SE - crossing I-405 from 106th Ave. SE to 112th Place SE - Add sidewalks
Bothell	NM. CR-2	Fitzgerald Rd/27th Ave. - crossing I-405 from 228th St. SE to 240th St. SE - Add ped/bike facility
King County	NM. CR-3	SR-524 (Filbert Road) - crossing I-405 from North Rd to Locust Way - Add sidewalk/paved shoulder
King County	NM. CR-4	Damson Road - crossing I-405 from 192nd St SW to Logan Rd - Add sidewalk/paved shoulder
Renton	NM. CR-5	NE Park Drive - crossing I-405 from SR-900/Sunset Blvd to Lake Wash Blvd - Add sidewalk/paved shoulder
Renton	NM. CR-6	Jackson SW/Longacres Dr SW - crossing I-405 from S. Longacres Way to Monster Rd SW - Add sidewalk/paved shoulder
Bothell	NM. CR-7	Connection between Sammamish River Trail and North Creek Trail - between SR-522 and NE 195th St. - Add ped/bike over-crossing of I-405
Bothell	NM. CR-8	SR-527 - crossing I-405 from 220th St SE to 228th St SE - ped/bike facility

Pedestrian/Bicycle Connections		
Bellevue	NM.P&B-4	Lake Washington Blvd - SR 405 to SE 60th - Add ped/bike facilities
Bellevue, Kirkland	NM.P&B-2	BNSF Right of Way - SE 8th to Totem Lake - Add ped/bike facility.
Bellevue, Newcastle, Renton	NM.P&B-6	Lake Washington Blvd/112th - SE 60th to May Creek I/C - Add ped/bike facility
Bothell	NM.P&B-5	North Creek Trail Link - 240th to 232nd - Add ped/bike trail.
Renton	NM. P&B 14	Cedar River Trail S. Extension - I-405 to Burnett Ave - Add ped/bike facilities (ETP NM-17)
Renton	NM. P&B 15	Cedar River Trail/Lake Washington Blvd Connector - Cedar River Trail to Lk Wash Blvd Loop - Add ped/bike facilities (ETP NM-15)
Renton	NM. P&B 16	Cedar-Duwamish Trail Connection - I-405 to Interurban Ave. S. - Add ped/bike facilities
Renton	NM. P&B 17	I-405/SR-167 trail connection - Lind Ave. SE to Talbot Rd S. - Add trail connection
Renton/Tukwila	NM. P&B 18	I-405/1-5 - via or around I-405/I-5 interchange - Add ped/bike facilities
Tukwila	NM. P&B 19	SR-181/W. Valley Hwy - crossing I-405 from Strander Blvd to Fort Dent Way - Add bike lanes

22. I-405 CORRIDOR INTELLIGENT TRANSPORTATION SYSTEM ENHANCEMENTS

Overview

This major element provides ITS enhancements to facilitate more reliable traffic flow.

I-405 Corridor ITS Enhancements		
Jurisdiction	**Project ID**	**Projects**
Various	ITS.1	Add Camera Coverage to decrease TMC blind spots
Various	ITS.2	Complete Ramp Metering
Various	ITS.4	Dual Lane Ramp Metering
Various	ITS.5	Increased Incident Response
Various	ITS.6	Traffic adaptive control on arterials
Various	ITS.7	TIS before all major decision points
Various	ITS.8	WSDOT support of in-vehicle traffic information
Various	ITS.9	Arterial camera coverage

23. I-405 CORRIDOR FREIGHT ENHANCEMENTS

Overview

This major element focuses on improvements specific to freight movements. Note that freight will benefit as well from general purpose traffic expansion described in other elements.

I-405 Corridor Freight Enhancements		
Jurisdiction	**Project ID**	**Projects**
Renton	R.FR-10	Modify SR 167 Interchange for East to South Freight movements
Various	R.FR-11	Improve truck flow with ITS
Various	R.FR-23	Remote area for overnight freight parking and staging for early morning deliveries
Various	R.FR-26	Full depth shoulders for truck usage on key freeways and arterials)
Various	R.FR-27	Traveler Information System (TIS) on SR 167 for I-405 “options”
Various	R.FR-28	TIS on I-5 for SR 18/I-90; and 164th to I-405; and South 200th to I-405
Various	R.FR-29	Centralized fax/radio for real time congestion reporting for dispatchers and truck drivers. Leverage WSDOT video linkages (e.g., a “T-911” number).
Various	R.FR-30	Hours of operation and service periods optimized—“JIT” redefined for applicable service sectors (e.g. restaurants)
Various	R.FR-32	Light cargo delivery using Sound Transit service

APPENDIX B
Alternatives Project Matrix

APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

					Alternatives				
		Jurisdiction	*ACTIONS*		5	1	2	3	4
Element #					**No Action**	**HCT/TDM**	**Mixed Mode with HCT/Transit Emphasis**	**Mixed Mode**	**General Capacity**
10.	**Basic I-405 Improvement Projects**								
	Renton	R.BI-1 & R.FR-10	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167			✓	✓	✓	✓
	Kirkland	R.BI-2	Continue NB climbing Lane from NE 70th to NE 85th and continue as auxiliary Lane to NE 116th			✓	✓		✓
	Kirkland	R.BI-3	SB auxiliary Lane NE 124th to NE 85th			✓	✓		✓
	Bellevue	R.BI-4	I-90 / Coal Creek Interchange			✓	✓	✓	✓
	Both,King Co,Kirk	R.BI-5	SB SR 522 to 124th continue climbing lane as an auxiliary lane			✓	✓		✓
	Bothell	R.BI-6	NB auxiliary lane SR 522 to SR 527			✓	✓		✓
	Renton	R.BI-7	Kennydale Hill climbing lane - SR 900 to 44th - NB 900 to 30th, SB 44th - 30th			✓	✓		✓
	Bellevue	R.BI-8	I-90 to Bellevue SB HOV direct connection to I-90 west			✓	✓		✓
	Bellevue	R.BI-9	NB auxiliary lane I-90 to NE 8th			✓	✓		✓
	Bellevue	R.BI-10	Increase SR 405 to Eastbound SR 520 Ramp capacity			✓	✓		✓
	Renton	R.BI-14	NB Auxilliary Lane I-5 to SR 167			✓	✓		✓
	Various	R.FR.24	Improve interchange geometrics at all major truck routes (WB-20 Design Criteria)			✓	✓	✓	✓
10.	**Committed Freeway Projects**								
	Joint	R-17 & R-17(17)	I-90/SR 900 Interchange and SR 900 improvements/Interchange reconfiguration Outside of Study Area						
	Joint	R-19	I-90/Sunset Way Interchange/Complete interchange and upgrade nonmotorized connections. Outside of Study Area						
	WSDOT	R-55	I-405/SR 167 Interchange/Construct new southbound I-405-to-southbound SR 167 ramp modification.		✓	✓	✓	✓	✓
	SR 405 Through Capacity (TC)								
11.	**Two additional GP lanes in each direction**								
	Tukwila,Renton	R.TC-1	Two additional GP lanes in each direction - SR 5 Tukwila to SR 167					✓	
	Renton	R.TC-2	Two additional GP lanes in each direction - SR 167 to SR 900/North Renton I/C					✓	
	Renton, Nwcas,Bel	R.TC-3	Two additional GP lanes in each direction - SR 900/North Renton I/C to SR 90					✓	
	Bellevue	R.TC-4	Two additional GP lanes in each direction - SR 90 To SR 520					✓	
	Bellevue,Kirkland	R.TC-5	Two additional GP lanes in each direction - SR 520 to NE 70th					✓	
	Kirkland	R.TC-6	Two additional GP lanes in each direction - NE 70th to NE 124th					✓	
	Kirk,K C,Both	R.TC-7	Two additional GP lanes in each direction - NE 124th SR 522					✓	
	Bothell,Sno Co	R.TC-8	Two additional GP lanes in each direction - SR 522 to SR 527					✓	
	Sno Co	R.TC-9	Two additional GP lanes in each direction - SR 527 to SR 5 Swamp Creek					✓	
13.	**Express Lanes- 2 lanes each direction between major interchanges**								
	Tukwila,Renton	R.TC-20 + R.TC-29a	Add Express lanes - SR 5 Tukwila to SR 167						✓
	Renton	R.TC-21	Add Express lanes - SR 167 to SR 900 North Renton						✓
	Ren, Nwcas,Bel	R.TC-22 + R.TC-33	Add Express lanes -SR 900 North Renton I/C to SR 90						✓
	Bellevue	R.TC-23	Add Express lanes - SR 90 to SR 520						✓
	Bellevue,Kirkland	R.TC-24 + R.TC-32	Add Express lanes - SR 520 to NE 70th						✓
	Kirkland	R.TC-25	Add Express lanes - NE 70th to NE 124th						✓
	Kirk,K C,Both	R.TC-26 + R.TC-31	Add Express lanes - NE 124th to SR 522						✓
	Bothell,Sno Co	R.TC-27	Add Express lanes - SR 522 to SR 527						✓
	Sno. Co	R.TC-29 + R.TC-30	Add Express Lanes - SR 527 to SR 5 Swamp Creek						✓
	Renton	R.TC-28	Add Express lanes- on SR 167 north of 180th up to I-405						✓

∗ Evaluated within another project

APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

					Alternatives				
		Jurisdiction	*ACTIONS*		5	1	2	3	4
Element #					**No Action**	**HCT/TDM**	**Mixed Mode with HCT/Transit Emphasis**	**Mixed Mode**	**General Capacity**
13.	**Express Lanes - Access Locations**								
	Tuk & Renton		R.TC-29a & R.TC-20	Southern end to Express lanes - Between SR 181 and SR 167					✓ ✻
	Snohomish Co		R.TC-30 & R.TC-29	Northern end to Express lanes - Between SR 527 and I-5					✓ ✻
	King Co,Kirkland		R.TC-31 & R.TC-26	Slip Ramp- South of NE 160th St					✓ ✻
	Kirkland		R.TC-32 & R-TC-24	Slip Ramp- South of NE 70th St					✓ ✻
	Bellevue, Newcastle		R.TC-33 & R.TC-22	Slip Ramp- South of Coal Creek Pkwy					✓ ✻
	Renton		R.TC-34	Interchange access location- SR 167					✓
14.	**Widen SR 167 by 1 lane each direction to study Area boundary**								
	Renton, Kent		R.CF-8	SR 167 I-405 to Study Area Boundary			✓	✓	✓
14A.	**SR 167 / I-405 Interchange Improvements**								
	Renton		R.FR-10 & R.BI-1	SR 167/I-405 Interchange Add Directional Ramps for major movements			✓ ✻	✓ ✻	✓ ✻
16.	**Connecting Freeway Capacity (Matched to fit I-405 Improvements)**								
	Tuikwila		R.CF-1	SR 518 I-405 to SR 99/Airport Access			✓	✓	✓
	Bellevue		R.CF-3	I-90 South Bellevue to Eastgate				✓	✓
	Bellevue		R.CF-4	SR 520 Bellevue Way to 148th					✓
	Bothell, Woodin		R.CF-5	SR 522 Bothell to NE 195th			✓	✓	✓
	Sno Co, Lynnwood		R.CF-6	SR 525 I-405 to SR 99			✓	✓	✓
	Tukwila		R.CF-9	I-5 at Tukwila			✓	✓	✓
	Lynnwood		R.CF-10	I-5 at Swamp Creek - 44th to 155th			✓	✓	✓
10A.	**One additional GP or Auxiliary lane in each direction**								
	Tukwila,Renton		R.TC-9	One additional GP lanes in each direction - SR 5 Tukwila to SR 167			✓		✓
	Renton		R.TC-10	One additional GP lanes in each direction - SR 167 to SR 900/North Renton I/C			✓		✓
	Ren, Nwcas,Bel		R.TC-11	One additional GP lanes in each direction - SR 900/North Renton I/C to SR 90			✓		✓
	Bellevue		R.TC-12	One additional GP lanes in each direction - SR 90 To SR 520			✓		✓
	Bellevue,Kirkland		R.TC-13	One additional GP lanes in each direction - SR 520 to NE 70th (Varify need for additional through capacity on this section)			✓		✓
	Kirkland		R.TC-14	One additional GP lanes in each direction - NE 70th to NE 124th			✓		✓
	Kirk,K C,Both		R.TC-15	One additional GP lanes in each direction - NE 124th SR 522			✓		✓
	Bothell,Sno Co		R.TC-16	One additional GP lanes in each direction - SR 522 to SR 527			✓		✓
	Sno. Co		R.TC-17	One additional GP lanes in each direction - SR 527 to SR 5 Swamp Creek			✓		✓
18.	**Arterial Capacity (AC) Actions**								
	King Co		R.AC-2 & R-39	138th Ave - Petrovitsky Rd to SR 169- Add 1 lane. See R-39					
	King Co, Renton		R.AC-3	138th Ave SE - Construct roadway link to 4/5 lanes- SR 169 to NE 4th St				✓	✓
	Ren, Nwcas,Bel		R.AC-4	140th Ave/Coal Creek Pkwy- Widen to 6 lanes to I-405					
	Redmond		R.AC-15 & R-111	Willows Rd- NE 90th St to NE 124th St- Add 1 lane each direction					✓ ✻
	King Co,Woodin		R.AC-16	Willows Rd- NE 124th St to NE 145th St- construct new facility -4/5 lanes				✓	✓
	Woodinville		R.AC-17 & R.PA-28	SR 202- NE 145th St to SR 522- widen to 5 lanes				✓ ✻	✓ ✻
	Red,K C,Woodin		R.AC-18 & R.PA-28	SR 202 - NE 90th to NE 145th					✓ ✻
	Ren, K C, Issaqu		R.AC-19 & R.IC-5	SR 900 - SR 405 to Edmonds. Additional capacity is not needed					
	Both,S C,Mill Cr		R.AC-20	SR 527/Bothell Everett Hwy - SR 522 to SR 524 - Widen by 1 lane each direction					✓
	Both,Woodin		R.AC-30 & R.PA-25	SR 202 connection across SR 522 to 120th				✓ ✻	✓ ✻
	Bothell		R.AC-34	120th Ave NE - SR 522 to NE 195th (4 lns existing additioal not needed)					

✻ ***Evaluated within another project***

APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

					Alternatives				
	Jurisdiction	*ACTIONS*			5	1	2	3	4
Element #					**No Action**	**HCT/TDM**	**Mixed Mode with HCT/Transit Emphasis**	**Mixed Mode**	**General Capacity**
	Tukwila	R.AC-35	SR 181- S 180th to S 200th						✓
	Tukwila	R.AC-36& R.IC-3	SR 181- 144th to Strander Blvd.						✓ ✻
	Tukwila	R.AC-37	Southcenter Pky - Tukwila Pky to Strander Blvd						✓
19.	**Arterial Interchange Improvements (Matched to fit I-405 Improvements)**								
	Tukwila	R.IC-3 & R.AC-36	SR 181 West Valley Highway/ Interurban See R.AC-36				✓	✓	✓
	Renton	R.IC-4 & R.HOV-43	SR 169 Maple Valley Hwy SR 900 to NE 5th See R.HOV-43				✓ ✻	✓ ✻	✓
	Renton	R.IC-5 & R.AC-19	SR 900/ Park - Lake Washington Blvd to Edmonds. Additional capacity is not needed.						
	Bellevue	R.IC-6	Coal Creek Pkwy I-405 to Factoria Blvd.		✓	✓	✓	✓	✓
	Kirkland, Redmond	R.IC-8	NE 85th St-Kirkland Way to 124th				✓	✓	✓
	Kirkland	R.IC-9	NE 116th- 114th Ave NE to 124th Ave NE				✓	✓	✓
	Kirkland	R.IC-10	NE 124th- 113th Ave NE to 124th Ave NE				✓	✓	✓
	Bothell	R.IC-11 & R.HOV-41	SR 527-228th to SR 524				✓	✓	✓
	Renton	R.IC-12 & R.HOV-33	Port Quendall overpass at SE 44th. See R.HOV-33						
	Kirk,King Co	R.IC-14	New half diamond interchange to/from north at NE 132nd St					✓	✓
	Bothell	R.IC-21	New SR 405 Interchange at 240th Street SE(Bothell)					✓	✓
	Bothell	R.IC-24 & R-40	NE 160th Street-112th Ave to Juanita/Woodinville Wy See R-40				✓ ✻	✓ ✻	✓ ✻
	Bothell	R.!C-25	NE 195th Street-Ross Rd to North Creek Pkwy (additional capacity not needed)						
	Kirkland	R.IC-26 & R.PA-13	NE 132nd - 113th to 124th Ave NE					✓ ✻	✓ ✻
12.	**Collector Distributors (CD) Matched to fit I-405 Improvements**								
	Renton	R.CD-1	SR-167, SR-169, Sunset and SR 900/North Renton;						
	Bellevue	R.CD-2	Coal Creek, SR 90, SE 8th, NE 4th, NE 8th and SR 520;						
	Kirkland	R.CD-3	NE 70th and NE 85th;						
	Kirkland	R.CD-4	NE 116th and NE 132nd;						
	Bothell, King Co	R.CD-5	NE 160th, SR-522 and SR 527						
	HOV (HOV)								
7.	**Committed HOV Projects**								
	Bellevue	HOV-01	I-405 at NE 4th/6th/8th (Bellevue) / Construct new HOV direct access at NE 6th, Improve arterial capacity at NE 4th/8th interchanges		✓	✓	✓	✓	✓
	Bellevue	HOV-02	I-90 (Eastgate) / New I-90 HOV direct access connection to P&R		✓	✓	✓	✓	✓
	WSDOT	HOV-14	I-405 (I-5 Swamp Creek to SR 527)/Construct NB and SB HOV lanes total 6 lanes		✓	✓	✓	✓	✓
	KCDOT	HOV-15	E Lk Samm Pkwy (Iss-Fall City Rd to I-90 on ramp)/Widen to 4/5 lanes + HOV lanes. Outside of Study Area						
	ST	HOV-101	I-405 @ Lind/HOV direct access improvements.					✓	
	ST	HOV-102, R.HOV-58 & R.PA-1	Woodinville Arterial Enhancements/HOV arterial enhancements		✓	✓	✓	✓	✓
	Renton	R.HOV-32	Between Sunset and SR-900 /Park Ave interchange in Renton		✓	✓	✓	✓	✓
	Renton	R.HOV-33 & R.IC-12	NE 44th I/C - HOV Direct Access and Arterial Improvements(Assumes Port Quendall)		✓	✓	✓	✓	✓
	Kirkland	R.HOV-61	NE 85th					✓	
	Bothell	R.HOV-62	SR 522 Campus Access		✓	✓	✓	✓	✓
	Bothell	R.HOV-63	SR 527		✓	✓	✓	✓	✓
	Tukwila	R.HOV-64	Southcenter (In-Line Station). In line station at this location has been dropped.						
	ST	R.HOV-66	I-405 at NE 128th St/HOV Direct Access Improvements		✓	✓	✓	✓	✓

✻ ***Evaluated within another project***

APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

					Alternatives				
		Jurisdiction		*ACTIONS*	5	1	2	3	4
Element #					**No Action**	**HCT/TDM**	**Mixed Mode with HCT/Transit Emphasis**	**Mixed Mode**	**General Capacity**
7.	**HOV Interchange Ramps (Direct Access)**								
	Tukwila		R.HOV-25	SR 5 I/C @ Tukwila Fwy to Fwy HOV ramps,			✓	✓	✓
	Renton		R.HOV-26	SR 167 I/C Fwy to Fwy HOV ramps,			✓	✓	✓
	Bellevue		R.HOV-27	SR 90 I/C Fwy to Fwy HOV ramps,			✓	✓	✓
	Bellevue		R.HOV-28	SR 520 Fwy to Fwy HOV ramps,			✓	✓	✓
	Bothell		R.HOV-29	SR 522 Fwy to Fwy HOV Ramps			✓	✓	✓
	Sno. Co.		R.HOV-30	SR 5 I/C @ Swamp Creek Fwy HOV ramps.			✓	✓	✓
	Newcastle		R.HOV-65	112th St SE (In-Line Station)			✓		
6.	**Arterial HOV**								
	Bellevue		R.HOV-36	Coal Creek Pkwy from I-405 to Forest Drive		✓	✓	✓	
	Bellevue		R.HOV-37	NE 8th Street from I-405 to 120th Ave NE		✓	✓	✓	
	Kirk, Redmond		R.HOV-38	NE 85th St from Kirkland Way to 148th Ave NE Vicinity		✓	✓	✓	
	Kirkland		R.HOV-39	NE 116th from 115th Ave NE to 124th Ave NE		✓	✓	✓	
	Kirkland		R.HOV-40	NE 124th from 113th Ave NE to 132 Ave NE		✓	✓	✓	
	Bothell		R.HOV-41 & R.IC-11	SR 527 From SE 228th St to SR 524		✓	✓ ⁎	✓ ⁎	
	Renton		R.HOV-43 & R.IC-4	SR 169 from SR 405 to Riverview Park Vicinity - HOV/Transit Preferential treatment.		✓	✓	✓	
	Renton		R.HOV-44	SW 27th St Corridor in Renton from Oaksdale Ave to SR 167		✓	✓	✓	
	Redmond		R.HOV-47	Avondale Rd from Novelty Hill Rd to Avondale Way/ Construct SB HOV lane		✓	✓	✓	
	Renton, King Co		R.HOV-48	SW 43 St from SR 167 to 140 Ave SE		✓	✓	✓	
	Renton		R.HOV-49	Logan Ave N/N 6 St from S 3 St to Park Dr, Transit Signal Priority		✓	✓	✓	
	Renton		R.HOV-51	Park Dr/Sunset Blvd from Garden Ave to Duvall Ave NE, Que Bypass'		✓	✓	✓	
	Kenmore		R.HOV-53 & R.PA-11	68 Ave NE (Simonds Rd to SR 522) - Construct NB HOV lane		✓	✓	✓	
	Redmond		R.HOV-55	Willows Rd (Redmond Wy to NE 124 St)		✓	✓	✓	
	Kirkland, Bellevue		R.HOV-56	Lake Washington Blvd (SR 520 to Yarrow Bay) - HOV lanes		✓	✓	✓	
	Kirkland		R.HOV-57	NE 68 St/NE 72 Pl (I-405 Vicinity) Que Bypass'		✓	✓	✓	
	Bothell, Woodin Renton, King Co		R.HOV-58, HOV-102 & R.PA-1 R.HOV-59	SR 522 (I-405 to SR 527 - Bothell) WB HOV Que Bypass - See HOV-102 Benson Rd - I-405 to SE Carr Rd - No Project					
	Bellevue		R.HOV-60	Bellevue Way - I-90 to South Bellevue Park and Ride Vicinity		✓	✓	✓	
23.	**Freight (F)**								
	Renton		R.FR-10 & R.BI-1	Modify SR 167 Interchange for East to South Freight movements		✓ ⁎	✓ ⁎	✓ ⁎	
	Various		R.FR-11	Improve truck flow with ITS		✓	✓	✓	
	Various		R.FR-23	Remote area for overnight freight parking and staging for early morning deliveries		✓	✓	✓	
	Various		R.FR-26	Full depth shoulders for truck usage on key freeways and arterials)		✓	✓	✓	
	Various		R.FR-27	Traveler Information System (TIS) on SR 167 for I-405 "options"		✓	✓	✓	
	Various		R.FR-28	TIS on I-5 for SR 18/I-90; and 164th to I-405; and South 200th to I-405		✓	✓	✓	
	Various		R.FR-29	Centralized fax/radio for real time congestion reporting for dispatchers and truck drivers. Leverage WSDOT video linkages (e.g., a "T-911" number).		✓	✓	✓	
	Various		R.FR-30	Hours of operation and service periods optimized—"JIT" redefined for applicable service sectors (e.g. restaurants)		✓	✓	✓	
	Various		R.FR-32	Light cargo delivery using Sound Transit service		✓	✓	✓	
22.	**Intelligent Transportation Systems (ITS)**								
	Various		ITS-1	Add Camera Coverage to decrease TMC blind spots		✓	✓	✓	✓
	Various		ITS-2	Complete Ramp Metering		✓	✓	✓	✓
	Various		ITS-4	Dual Lane Ramp Metering		✓	✓	✓	✓

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APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

						Alternatives				
		Jurisdiction		*ACTIONS*		5	1	2	3	4
Element #						**No Action**	**HCT/TDM**	**Mixed Mode with HCT/Transit Emphasis**	**Mixed Mode**	**General Capacity**
		Various		ITS-5	Increased Incident Response		✓	✓	✓	✓
		Various		ITS-6	Traffic adaptive control on arterials		✓	✓	✓	✓
		Various		ITS-7	TIS before all major decision points		✓	✓	✓	✓
		Various		ITS-8	WSDOT support of in-vehicle traffic information		✓	✓	✓	✓
		Various		ITS-9	Arterial camera coverage		✓	✓	✓	✓
4.	**High Capacity Transit (Physically Separated, Fixed Guideway HCT)**									
		Tuk. & Renton		T.HCT-1	HCT- SeaTac to Renton CBD		✓	✓		
		Renton		T.HCT-2	HCT-Renton CBD to NE 44th (Port Quendall)		✓	✓		
		Ren< New & Bel		T.HCT-3	HCT- NE 44th (Port Quendall) to Factoria		✓	✓		
		Bell & Issa		T.HCT-4	HCT - Factoria To Issaquah		✓	✓		
		Bellevue		T.HCT-5	HCT Factoria to Downtown Bellevue		✓	✓		
		Bell & Red		T.HCT-6	HCT - Bellevue to Redmond		✓	✓		
		Bell & Kirk		T.HCT-7	HCT- Bellevue to Totem Lake		✓	✓		
		Kirk & King Co		T.HCT-8	HCT - Totem Lake to Bothell		✓	✓		
		Various		T.HCT-9	HCT - Bothell to Lynnwood		✓	✓		
4.	**High Capacity Transit (Bus rapid transit [BRT] operating improved access HOV lanes on the existing freeway system)**									
		Tuk. & Renton		T.HCT-1	HCT- SeaTac to Renton CBD				✓	
		Renton		T.HCT-2	HCT-Renton CBD to NE 44th (Port Quendall)				✓	
		Ren< New & Bel		T.HCT-3	HCT- NE 44th (Port Quendall) to Factoria				✓	
		Bell & Issa		T.HCT-4	HCT - Factoria To Issaquah				✓	
		Bellevue		T.HCT-5	HCT Factoria to Downtown Bellevue				✓	
		Bell & Red		T.HCT-6	HCT - Bellevue to Redmond				✓	
		Bell & Kirk		T.HCT-7	HCT- Bellevue to Totem Lake				✓	
		Kirk & King Co		T.HCT-8	HCT - Totem Lake to Bothell				✓	
		Various		T.HCT-9	HCT - Bothell to Lynnwood				✓	
4.	**High Capacity Transit Stations**									
		Sea-Tac		HCT.TS-1	Sea-Tac (Outside of Study Area)					
		Tukwila		HCT.TS-2	Southcenter		✓	✓	✓	
		Tukwila & Renton		HCT.TS-3	Tukwila (Longacres)		✓	✓		
		Renton		HCT.TS-4	Downtown Renton		✓	✓	✓	
		Renton		HCT.TS-5	North Renton		✓	✓		
		Renton		HCT.TS-6	Port Quendall		✓	✓	✓	
		Bellevue		HCT.TS-7	Factoria		✓	✓	✓	
		Bellevue		HCT.TS-8	Bellevue Transit Center		✓	✓	✓	
		Bellevue		HCT.TS-9	Bellevue Library		✓	✓		
		Bell & Kirk		HCT.TS-10	SR 520/Northup Way		✓	✓	✓	
		Kirkland		HCT.TS-11	Downtown Kirkland (NE 85th Street)		✓	✓	✓	
		Kirkland		HCT.TS-12	Totem Lake		✓	✓	✓	
		Woodinville		HCT.TS-13	NE 145th Street		✓	✓		
		Woodinville		HCT.TS-14	Woodinville		✓	✓		
		Bothell		HCT.TS-15	NE 195th		✓	✓	✓	

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					Alternatives				
		Jurisdiction	*ACTIONS*		5	1	2	3	4
Element #					**No Action**	**HCT/TDM**	**Mixed Mode with HCT/Transit Emphasis**	**Mixed Mode**	**General Capacity**
		Bothell	HCT.TS-16	Canyon Park		✓	✓	✓	
		Sno County	HCT.TS-17	164th Street AW (AshWay)		✓	✓		
		Bellevue	HCT.TS-18	Eastgate		✓	✓	✓	
		King County	HCT.TS-19	Lakemont		✓	✓		
		Issaquah	HCT.TS-20	Issaquah 9Outside of Study area)					
		Bellevue	HCT.TS-21	132nd Avenue NE		✓	✓		
		Bellevue	HCT.TS-22	148th Avenue NE		✓	✓		
		Redmond	HCT.TS-23	Overlake (NE 40th Street)		✓	✓	✓	
		Redmond	HCT.TS-24	Redmond Town Center		✓	✓	✓	
		Redmond	HCT.TS-25	Bear Creek		✓	✓		
		Mercer Island	HCT.TS-26	Mercer Island		✓	✓	✓	
New	**Transit Service (TS)**								
		Various	TS-0	Twenty percent more service than in the proposed 6-year plans for sound Transit, METRO and Community Transit	✓	✓	✓	✓	✓
		Various	TS-1	Fifty percent more service assumed in the current 6-year plans for Sound Transit, METRO and Community Transit					✓
3.	**Transit Service (TS)**								
		Various	TS-2	Twice the service in the proposed 6-year plans for Sound Transit, METRO and Community Transit		✓	✓	✓	
8.	**Park and Rides (PR)**								
		Renton	T.PR-3	Renton Highlands	✓	✓	✓	✓	✓
		Tukwila & Ren	T.PR-6	Tukwila Commuter Rail (Longacres)	✓	✓	✓	✓	✓
		K C	T.PR-8	SR 169 and 140th Place SE		✓	✓	✓	
		K C	T.PR-9	Petrovitsky Rd and 157th Ave SE		✓	✓	✓	
		K C	T.PR-10	140th Ave SE and SE 192nd		✓	✓	✓	
		K C	T.PR-11	SR 515 and SE 208th		✓	✓	✓	
		Kent & Renton	T.PR-12	SR 167 and SW 43rd		✓	✓	✓	
		Kent & Renton	T.PR-13	SR 167 and 84th Ave		✓	✓	✓	
		Redmond	T.PR-17	Willows Rd @ NE 100th		✓	✓	✓	
		Redmond	T.PR-18	SR 202 @ NE 100th		✓	✓	✓	
		Bell & Kirk	T.PR-20	South Kirkland	✓	✓	✓	✓	✓
		Redmond	T.PR-21	Overlake	✓	✓	✓	✓	✓
		Bellevue	T.PR-22	South Bellevue	✓	✓	✓	✓	✓
		Bellevue	T.PR-23	Newport (112th Ave. SE)	✓	✓	✓	✓	✓
		KC	T.PR-24	NE 160th/Brickyard Rd	✓	✓	✓	✓	✓
		Bothell	T.PR-25	Canyon Park (SR 405 and SR 527)	✓	✓	✓	✓	✓
		KC	T.PR-26	SR 202 @ NE 145th		✓	✓	✓	
		Tukwila	T.PR-30	Tukwila	✓	✓	✓	✓	✓
		Kirkland	T.PR-31	Houghton	✓	✓	✓	✓	✓
		Kirkland	T.PR-32	Kingsgate	✓	✓	✓	✓	✓
		Medina	T.PR-33	Evergreen Point	✓	✓	✓	✓	✓
		Bellevue	T.PR-34	Wilburton	✓	✓	✓	✓	✓
		King County	T.PR-35	Lakemont	✓	✓	✓	✓	✓
		Redmond	T.PR-36	Rendmond	✓	✓	✓	✓	✓
		Redmond	T.PR-37	Bear Creek	✓	✓	✓	✓	✓
		Bothell	T.PR-38	Bothell	✓	✓	✓	✓	✓

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APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

					Alternatives				
		Jurisdiction	*ACTIONS*		5	1	2	3	4
Element #					No Action	HCT/TDM	Mixed Mode with HCT/Transit Emphasis	Mixed Mode	General Capacity
		Kenmore	T.PR-39	Northshore	✓	✓	✓	✓	✓
		Kenmore	T.PR-40	Kenmore	✓	✓	✓	✓	✓
		Woodinville	T.PR-41	Woodinville	✓	✓	✓	✓	✓
		Mercer Island	T.PR-42	Mercer Island	✓	✓	✓	✓	✓
		Bellevue	T.PR-43	Eastgate	✓	✓	✓	✓	✓
9.	**Transit Centers (TC)**								
		Renton	T.TC-6	Downtown Renton	✓	✓	✓	✓	✓
		Bellevue	T.TC-8	Downtown Bellevue	✓	✓	✓	✓	✓
		Redmond	T.TC-9	Overlake	✓	✓	✓	✓	✓
		Kirkland	T.TC-12	Downtown Kirkland	✓	✓	✓	✓	✓
		Kirkland	T.TC-14	Totem Lake	✓	✓	✓	✓	✓
1.	**TDM (TDM)**								
		Various	TDM-1	TDM Package		✓	✓	✓	✓
			TDM-2	Expanded TDM Package- Regional Congestion Pricing		✓			
	Pedestrian and Bicycle Facilities (P&B)								
21.	**I-405 Crossings**								
		Bellevue	NM. CR-1	Lk Washington Blvd/112th Ave. SE - crossing I-405 from 106th Ave. SE to 112th Place SE - Add sidewalks		✓	✓	✓	✓
		Bothell	NM. CR-2	Fitzgerald Rd/27th Ave. - crossing I-405 from 228th St. SE to 240th St. SE - Add ped/bike facility		✓	✓	✓	✓
		King County	NM. CR-3	SR-524 (Filbert Road) - crossing I-405 from North Rd to Locust Way - Add sidewalk/paved shoulder		✓	✓	✓	✓
		Sno. County	NM. CR-4	Damson Road - crossing I-405 from 192nd St SW to Logan Rd - Add sidewalk/paved shoulder		✓	✓	✓	✓
		Renton	NM. CR-5	NE Park Drive - crossing I-405 from SR-900/Sunset Blvd to Lake Wash Blvd - Add sidewalk/paved shoulder		✓	✓	✓	✓
		Renton	NM. CR-6	Jackson SW/Longacres Dr SW - crossing I-405 from S. Longacres Way to Monster Rd SW - Add sidewalk/paved shoulder		✓	✓	✓	✓
		Bothell	NM. CR-7	Connection between Sammamish River Trail and North Creek Trail - between SR-522 and NE 195th St. - Add ped/bike overcrossing of I-405		✓	✓	✓	✓
		Bothell	NM. CR-8	SR-527 - crossing I-405 from 220th St SE to 228th St SE - ped/bike facility		✓	✓	✓	✓
21.	**Pedestrian/Bicycle Connections**								
		Bellevue,Kirkland	NM.P&B-2	BNSF Right of Way - SE 8th to Totem Lake - Add ped/bike facility.		✓	✓	✓	
		Bellevue	NM.P&B-4	Lk Washington Blvd - SR 405 to SE 60th - Add ped/bike facilities		✓	✓	✓	
		Bothell	NM.P&B-5	North Creek Trail Link - 240th to 232nd - Add ped/bike trail.		✓	✓	✓	
		Bel,Nwcas,Ren	NM.P&B-6	Lk Washington Blvd/112th - SE 60th to May Creek I/C - Add ped/bike facility		✓	✓	✓	
		Renton	NM.P&B-14	Cedar River Trail S. Extension - I-405 to Burnett Ave - Add ped/bike facilities		✓	✓	✓	
		Renton	NM.P&B-15	Cedar River Trail/Lake Washington Blvd Connector - Cedar River Trail to Lk Wash Blvd Loop - Add ped/bike facilities		✓	✓	✓	
		Renton	NM.P&B-16	Cedar-Duwamish Trail Connection - I-405 to Interurban Ave. S. - Add ped/bike facilities		✓	✓	✓	
		Renton	NM.P&B-17	I-405/SR-167 trail connection - Lind Ave. SE to Talbot Rd S. - Add trail connection		✓	✓	✓	
		Renton/Tukwila	NM.P&B-18	I-405/1-5 - via or around I-405/I-5 interchange - Add ped/bike facilities		✓	✓	✓	✓
		Tukwila	NM.P&B-19	SR-181/W. Valley Hwy - crossing I-405 from Strander Blvd to Fort Dent Way - Add bike lanes		✓	✓	✓	✓
17.	**Arterial Committed Projects**			(Note: ID numbers are same as ETP ID's					
		Bothell, Snohomish C	R.AC-21	120th NE/39th SE - NE 95th to Maltby Rd - 4/5 lanes including new connection	✓	✓	✓	✓	✓
		Bellevue	R-08	NE 29th Pl (148th Ave NE to NE 24th St)/Construct new 2-lane road	✓	✓	✓	✓	✓

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APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

				Alternatives				
	Jurisdiction	*ACTIONS*		5	1	2	3	4
Element #				No Action	HCT/TDM	Mixed Mode with HCT/Transit Emphasis	Mixed Mode	General Capacity
	Snohomish Co.	R-10	SR 524 (24 St SW to SR 527)--- Widen to 4/5 lanes including sidewalks, bike lanes	✓	✓	✓	✓	✓
	Bothell	R-13	Beardslee Blvd (Main St to I-405)Widen to 3 lanes+CGS (Project does not add capacity)					
	Joint	R-17 & R-17(10)	I-90/SR 900 Interchange and SR 900 improvements--- Interchange reconfiguration. Project is outside of the Study Area					
	Issaquah	R-18	Issaquah bypass (Issaquah-Hobart Rd to I-90)-- Construct new 4/5 lanes with separated ped/bike trail. Project is outside of the Study Area.					
	Kirkland	R-21	NE 120 St (Slater Ave to 124 Ave NE)--- Construct new 3-lane roadway with ped/bike facilities	✓				
	Redmond/ WSDOT	R-25	SR 202 Corridor Improvements(East Lake Sammamish Pkwy to Sahalee Way)--- Widen to 3/5 lanes; intersection improvements with bike/ped facilities	✓	✓	✓	✓	✓
	Redmond	R-26	NE 90 St (Willows Rd to SR 202)--- Construct new 4/5 lanes + bike facilities	✓	✓	✓	✓	✓
	Redmond	R-28	West Lake Sammamish Parkway (Leary Way to Bel-Red Rd)--- Widen to 4/5 lanes + CGS, bike lanes	✓	✓	✓	✓	✓
	Renton	R-36	Oakesdale Ave SW (SW 31st to SW 16th)--- Construct new 5 lane roadway with CGS	✓	✓	✓	✓	✓
	WSDOT	R-38	SR 522 (SR 9 to SR 2)--- Widen to 4 lanes					
	KCDOT	R-39 & R.AC-2	140 Ave SE (SR 169 to SE 208 St)--- Widen to 5 lanes SR 169 to SE 196 St, widen for turn channels on SE 196. Combines 2 King County CIP projects. A major North-South arterial which serves the Soos Creek Plateau and Fairwood.	✓	✓	✓	✓	✓
	KCDOT	R-40 & R.IC-24	Juanita-Woodinville Way (NE 145 St to 112th Ave NE) Widen to 5 lanes + CGS, walkway/pathway	✓	✓	✓	✓	✓
	KCDOT	R-41	East Lake Sammamish Pkwy (Issaquah-Fall City Rd to SE 56 St)--- Widen 4/5 lanes including bike facilities. Construct CGS; interconnect traffic signals. Project is outside of the Study Area.					
	Issaquah	R-42	Sammamish Plateau Access Road (I-90 to Iss.-Pine Lake Rd)-- Prepare EIS, construct new 5-lane arterial w/ CGS, bike lanes. Project is outside of the Study Area.					
	Sammamish	R-44	228 Ave SE (SE 24th to NE 8 St)--- Widen to 4/5 lanes + CGS, bike lanes. Planned in 2 phases. Project is outside of the Study Area.					
	KCDOT	R-45	Issaquah-Fall City Rd (Issaquah-Pine Lake Rd to Klahanie Dr) - Phase II & III--- Widen to 4/5 lanes + CGS, bike lanes. Project is outside of the Study Area.					
	KCDOT	R-47	NE 124 St (Willows Rd to SR 202)--- Widen to 4/5 lanes + CGS, bike facilities; traffic signal.	✓	✓	✓	✓	✓
	KCDOT	R-48	Avondale Rd (Tolt Pipeline to Woodinville-Duvall Rd)--- Widen to 3 lanes + walkway/pathway (Project does not add capacity)					
	Woodinville	R-51	Woodinville-Snohomish Rd/140 Ave NE (NE 175 St to SR 522)--- Widen to 4/5 lanes + CGS, bike lanes	✓	✓	✓	✓	✓
	KCDOT	R-52	Woodinville-Duvall Rd (NE 171st St to Avondale Rd)--- Widen to 5 lanes + shoulders (without widening towards Woodinville the added capacity can't be used)					
	Bellevue	R-101	150th Ave SE---Widen to 7 lanes from SE 36th to SE 38th; add turn lanes	✓	✓	✓	✓	✓
	Redmond	R-111 & R.AC-15	Willows Rd Corridor Improvements-- Channelization of Willows Rd/Redmond Way intersection and widening of Willows Rd from NE 116th to NE 124th	✓	✓	✓	✓	✓
	Snohomish Co.	R-117	39th Ave SE Realignment at SR 524 and York Rd--- Construct 4-way intersection to replace 2 offset intersections	✓	✓	✓	✓	✓
17.	**Planned Arterial Projects**							
	Sound Transit	R.PA-1, HOV-102 & R.HOV-58	SR 522 (Woodinville to Bothell)--- HOV enhancements (ETP 246) See HOV-102					
	Bellevue	R.PA-2	148 Ave SE (SE 24 St to SE 28 St) New SB lane from SE 24 St to the WB I-90 on-ramp (ETP 203)			✓	✓	✓
	Bothell	R.PA-3	SR 522 Multimodal Corridor Project--- Widen SR-522 mostly within existing ROW to provide transit lanes, safety improvements, consolidated driveways & left turn lanes; and sidewalks. (ETP R-107)			✓	✓	✓
	Bothell	R.PA-4	SR 524 (SR 527 to Bothell City Limit)--- Widen to 5 lanes + CGS, bike facilities (class III) (ETP R-11)			✓	✓	✓
	KCDOT	R.PA-5	SE 212 Way/SE 208 St (SR 167 to Benson Rd/SR 515)--- Widen to 6 lanes + bike facilities, Transit/HOV preferential treatment, turn channels. (ETP R-46)			✓	✓	✓
	KCDOT	R.PA-6	Petrovitsky Rd (143 Ave SE to 151 Ave SE) --- Widen to 5 lanes + CGS, bike lanes, traffic signal, interconnect (ETP 265). Project has already been constructed.					
	KCDOT	R.PA-7	Bear Creek Arterial (NE 80 St to Novelty Hill Rd)--- Corridor study and construction of new 3 lane arterial (ETP 141). Project is outside the study area					
	KCDOT	R.PA-8	NE 124/128 St (SR 202 to Avondale Rd)--- Widen to 4/5 lanes including bike & equestrian facilities (ETP 164)			✓	✓	✓
	KCDOT	R.PA-9	SE 208 St (116 Ave SE to 132 Ave SE)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signal (ETP 263). Project has already been constructed.					

∗ Evaluated within another project

APPENDIX B

I-405 Corridor Program EIS Alternatives Project Matrix

					Alternatives				
		Jurisdiction		*ACTIONS*	5	1	2	3	4
Element #					**No Action**	**HCT/TDM**	**Mixed Mode with HCT/Transit Emphasis**	**Mixed Mode**	**General Capacity**
		KCDOT	R.PA-10	NE 132 St Extension (132 Ave NE to Willows Rd Ext.)---- Construct new 3 lane arterial with CGS, bike lanes (ETP 61)			✓	✓	✓
		Kenmore/KCDOT	R.PA-11 & R.HOV-53	68 Ave NE (Simonds Rd to SR 522)--- Construct NB HOV lane total of 5/6 lanes (ETP 22)			✓ ✻	✓ ✻	✓
		Kirkland	R.PA-12	124 Ave NE (NE 85 St to Slater Rd NE)--- Widen to 3 lanes (s. of NE 116th St, 5 lanes n. of NE 116th St with ped/bike facilities (ETP R-23)			✓	✓	✓
		Kirkland	R.PA-13 & R.IC-26	NE 132 St (100 Ave NE to 116 Way NE)--- Widen to 3 lanes + CGS, Bike lane (ETP R-124)			✓	✓	✓
		Kirkland	R.PA-14	NE 100 St (117 Ave NE to Slater Ave) --- Construct bike/pedestrian/emergency Vehicle overpass across I-405 (ETP 309)			✓	✓	✓
		Newcastle	R.PA-15	Coal Creek Pkwy (SE 72 St to Renton City Limits)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signals (ETP R-24)			✓	✓	✓
		Redmond	R.PA-16	Redmond 148th Ave NE Corridor - 3 projects--- Turn lane and channelization improvements along corridor – BROTS;			✓	✓	✓
		Redmond	R.PA-17	Bear Creek Pkwy--- Construct new 162nd Ave NE arterial and new 72nd St arterial w/ bike/ped and CSG; widen Bear Creek Pkwy (ETP R-110)			✓	✓	✓
		Redmond	R.PA-18	Union Hill Rd (Avondale Rd to 196 Ave NE)--- Widen to 4/5 lanes with bike facilities (ETP R-27)			✓	✓	✓
		Renton	R.PA-19	Duvall Ave NE (NE 4 St to NE 25 Court -City Limits)--- Widen to 5 lanes + CGS, bikeway (ETP R-31)			✓	✓	✓
		Renton	R.PA-20	Oakesdale Ave SW (Monster Rd to SR 900) Replace Monster Rd Bridge; widen to 4/5 lanes +Bike Lanes + CGS (ETP R-35)			✓	✓	✓
		Renton	R.PA-21	Rainier Ave / Grady Way (intersection)-- Grade separation			✓	✓	✓
		Renton	R.PA-22	SW Grady Way (SR 167 to SR 515)--- Rechannelize and modify signals for a continuous eastbound lane (ETP R-37)			✓	✓	✓
		Renton	R.PA-23	SR 167 at East Valley Road--- New southbound off-ramp and signalization at East Valley Road (ETP 255)			✓	✓	✓
		Renton/ KCDOT	R.PA-24	Soos Creek Regional Links--- Placeholder for Trans-Valley Study (ETP R-115)			✓	✓	✓
		Woodinville	R.PA-25 & R.AC-30	SR 522 Interchange Package(SR 522/SR 202 &SR522/195th St)--- Access improvements and new freeway ramps (ETP R-53) (See R.AC-30)			✓	✓	✓
		Woodinville	R.PA-26	SR202 Corridor Package (SR202/148th Ave & SR202/127th Place)--- Intersection improvements (ETP R-54)			✓	✓	✓
		WSDOT	R.PA-27	SR 520/SR 202 Interchange --- Complete interchange by constructing a new ramp and thru lane on 202 to SR 520 (ETP R-29)			✓	✓	✓
		WSDOT	R.PA-28 & R.AC-17	SR 202 / 140 Place NE (NE 124 St to NE 175 St)--- Widen 4/5 lanes (ETP R-43) (See R.AC-17, 18)			✓	✓	✓
		WSDOT	R.PA-29	SR 202 (Sahalee Way to Bear Creek-Sammamish Arterial)-- Widen to 4/5 lanes (ETP 152). Project is outside the Study Area.					

✻ ***Evaluated within another project***

Appendix C

State Water Quality Standards

(WAC 173-201A-030)

WAC 173-201A-030 General water use and criteria classes. The following criteria shall apply to the various classes of surface waters in the state of Washington:

(1) **Class AA (extraordinary).**

(a) General characteristic. Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 9.5 mg/L.

(B) Marine water - dissolved oxygen shall exceed 7.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 7.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 16.0°C (freshwater) or 13.0°C (marine water) due to human activities. When natural conditions exceed 16.0°C (freshwater) and 13.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=23/(T+5) (freshwater) or t=8/(T-4) (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.2 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(2) **Class A (excellent).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 8.0 mg/L.

(B) Marine water - dissolved oxygen shall exceed 6.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 6.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 18.0°C (freshwater) or 16.0°C (marine water) due to human activities. When natural conditions exceed 18.0°C (freshwater) and 16.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=28/(T+7) (freshwater) or t=12/(T-2) (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.5 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(3) **Class B (good).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for most uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial and agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing and spawning.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 400 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 Ml.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 6.5 mg/L.

(B) Marine water - dissolved oxygen shall exceed 5.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 5.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 21.0°C (freshwater) or 19.0°C (marine water) due to human activities. When natural conditions exceed 21.0°C (freshwater) and 19.0°C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=34/(T+9) (freshwater) or t=16/(T) (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8°C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) and 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.5 units.

(vi) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be reduced by dissolved, suspended, floating, or submerged matter not attributed to natural causes, so as to affect water use or taint the flesh of edible species.

(4) **Class C (fair).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements of selected and essential uses.

(b) Characteristic uses. Characteristic uses shall include but not be limited to, the following:

(i) Water supply (industrial).

(ii) Fish (salmonid and other fish migration).

(iii) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(iv) Commerce and navigation.

(c) Water quality criteria - marine water:

(i) Fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 400 colonies/100 mL.

(ii) Dissolved oxygen shall exceed 4.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 4.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Temperature shall not exceed 22.0°C due to human activities. When natural conditions exceed 22.0°C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3°C.

Incremental temperature increases shall not, at any time, exceed t=20/(T+2).

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(iv) pH shall be within the range of 6.5 to 9.0 with a human-caused variation within a range of less than 0.5 units.

(v) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vi) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(vii) Aesthetic values shall not be interfered with by the presence of obnoxious wastes, slimes, aquatic growths, or materials which will taint the flesh of edible species.

(5) **Lake class.**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam and mussel rearing, spawning, and harvesting.

Crayfish rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(ii) Dissolved oxygen - no measurable decrease from natural conditions.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature - no measurable change from natural conditions.

(v) pH - no measurable change from natural conditions.

(vi) Turbidity shall not exceed 5 NTU over background conditions.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(6) **Establishing lake nutrient criteria.**

(a) The following table shall be used to aid in establishing nutrient criteria:

(Table 1) The ecoregional and trophic-state action values for establishing nutrient criteria:

Coast Range, Puget Lowlands, and Northern Rockies Ecoregions:		
Trophic State	If Ambient TP (µg/l) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Lower mesotrophic	>10-20	20 or less
	Action value	
	>20.....	lake specific study may be initiated.
Cascades Ecoregion:		
Trophic State	If Ambient TP (µg/l) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
	Action value	
	>10.....	lake specific study may be initiated.
Columbia Basin Ecoregion:		
Trophic State	If Ambient TP (µg/l) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Lower mesotrophic	>10-20	20 or less
Upper mesotrophic	>20-35	35 or less
	Action value	
	>35.....	lake specific study may be initiated.

Lakes in the Willamette, East Cascade Foothills, or Blue Mountain ecoregions do not have recommended values and need to have lake-specific studies in order to receive criteria as described in (c)(i) of this subsection.

(b) The following actions are recommended if ambient monitoring of a lake shows the epilimnetic total phosphorus concentration, as shown in Table 1 of this section, is below the action value for an ecoregion:

(i) Determine trophic status from existing or newly gathered data. The recommended minimum sampling to determine trophic status is calculated as the mean of four or more samples collected from the epilimnion between June through September in one or more consecutive years. Sampling must be spread throughout the season.

(ii) Propose criteria at or below the upper limit of the trophic state; or

(iii) Conduct lake-specific study to determine and propose to adopt appropriate criteria as described in (c) of this subsection.

(c) The following actions are recommended if ambient monitoring of a lake shows total phosphorus to exceed the action value for an ecoregion shown in Table 1 of this section or where recommended ecoregional action values do not exist:

(i) Conduct a lake-specific study to evaluate the characteristic uses of the lake. A lake-specific study may vary depending on the source or threat of impairment. Phytoplankton blooms, toxic phytoplankton, or excessive aquatic plants, are examples of various sources of impairment. The following are examples of quantitative measures that a study may describe: Total phosphorus, total nitrogen, chlorophyll-a, dissolved oxygen in the hypolimnion if thermally stratified, pH, hardness, or other measures of existing conditions and potential changes in any one of these parameters.

(ii) Determine appropriate total phosphorus concentrations or other nutrient criteria to protect characteristic lake uses. If the existing total phosphorus concentration is protective of characteristic lake uses, then set criteria at existing total phosphorus concentration. If the existing total phosphorus concentration is not protective of the existing characteristic lake uses, then set criteria at a protective concentration. Proposals to adopt appropriate total phosphorus criteria to protect characteristic uses must be developed by considering technical information and stakeholder input as part of a public involvement process equivalent to the Administrative Procedure Act (chapter 34.05 RCW).

(iii) Determine if the proposed total phosphorus criteria necessary to protect characteristic uses is achievable. If the recommended criterion is not achievable and if the characteristic use the criterion is intended to protect is not an existing use, then a higher criterion may be proposed in conformance with 40 CFR part 131.10.

(d) The department will consider proposed lake-specific nutrient criteria during any water quality standards rule making that follows development of a proposal. Adoption by rule formally establishes the criteria for that lake.

(e) Prioritization and investigation of lakes by the department will be initiated by listing problem lakes in a watershed needs assessment, and scheduled as part of the water quality program's watershed approach to pollution

Appendix D

Pollutant Loading Calculations by I-405 Segment

	Segment	Alternative	Wet hr/yr [1]	ADT [2]	VDS/yr	K	C	TSS	Hwy Length [3]	TSS	COD	TSS (x 100)	COD (x 100)	Zn	Cu	TN	TP	Remarks
			wet hr/yr	veh/day	VDS/yr	lb TSS/hwy-mi/1000 VDS		lb/hwy-mi/yr	mi	lb/yr	lb/yr			lb/yr	lb/yr	lb/yr	lb/yr	
1	I-5 To SR 167	1	911	118,550	4,499,960	6.4	0.75	21,600	22.4	483,836	193,534	4,838	1,935	1,788	193	2,274	1,016	East of SR 181
		2	911	181,441	6,887,198	6.4	0.75	33,059	22.4	740,512	296,205	7,405	2,962	4,134	421	3,480	1,555	
		3	911	231,693	8,794,680	6.4	0.75	42,214	32	1,350,863	540,345	13,509	5,403	9,579	952	6,349	2,837	
		4	911	250,249	9,499,035	6.4	0.75	45,595	32	1,459,052	583,621	14,591	5,836	11,158	1,101	6,858	3,064	
		No Action	911	119,980	4,554,241	6.4	0.75	21,860	19.2	419,719	167,888	4,197	1,679	1,569	169	1,973	881	
												0	0					
2	SR 167 to SR 900/North Renton I/C	1	911	147,715	5,607,015	6.4	0.75	26,914	13.2	355,260	142,104	3,553	1,421	1,624	170	1,670	746	South of SR169
		2	911	209,106	7,937,315	6.4	0.75	38,099	13.2	502,908	201,163	5,029	2,012	3,225	324	2,364	1,056	
		3	911	263,335	9,995,758	6.4	0.75	47,980	22.1	1,060,350	424,140	10,603	4,241	8,525	838	4,984	2,227	
		4	911	292,556	11,104,938	6.4	0.75	53,304	22.1	1,178,012	471,205	11,780	4,712	10,504	1,024	5,537	2,474	
		No Action	911	148,110	5,622,009	6.4	0.75	26,986	13.2	356,210	142,484	3,562	1,425	1,633	171	1,674	748	
												0	0					
3	SR 900/North Renton I/C to SR 90	1	911	122,728	4,658,550	6.4	0.75	22,361	33.6	751,331	300,532	7,513	3,005	2,871	308	3,531	1,578	South of SE60th
		2	911	196,444	7,456,687	6.4	0.75	35,792	33.6	1,202,614	481,046	12,026	4,810	7,256	733	5,652	2,525	
		3	911	250,470	9,507,424	6.4	0.75	45,636	56	2,555,596	1,022,238	25,556	10,222	19,561	1,930	12,011	5,367	
		4	911	287,319	10,906,150	6.4	0.75	52,350	56	2,931,573	1,172,629	29,316	11,726	25,679	2,506	13,778	6,156	
		No Action	911	123,050	4,670,773	6.4	0.75	22,420	33.6	753,302	301,321	7,533	3,013	2,886	310	3,541	1,582	
												0	0					
4	SR 90 To SR 520	1	911	176,807	6,711,299	6.4	0.75	32,214	31.9	1,027,634	411,054	10,276	4,111	5,595	572	4,830	2,158	South of Main St
		2	911	234,879	8,915,615	6.4	0.75	42,795	31.9	1,365,159	546,064	13,652	5,461	9,811	974	6,416	2,867	
		3	911	294,826	11,191,104	6.4	0.75	53,717	45.7	2,454,880	981,952	24,549	9,820	22,057	2,148	11,538	5,155	
		4	911	326,902	12,408,655	6.4	0.75	59,562	45.7	2,721,963	1,088,785	27,220	10,888	27,076	2,618	12,793	5,716	
		No Action	911	179,002	6,794,618	6.4	0.75	32,614	30.4	991,471	396,588	9,915	3,966	5,463	558	4,660	2,082	
												0	0					
5	SR 520 To NE 70th	1	911	162,593	6,171,759	6.4	0.75	29,624	26.1	773,198	309,279	7,732	3,093	3,880	401	3,634	1,624	South of NE 70th
		2	911	202,126	7,672,366	6.4	0.75	36,827	26.1	961,194	384,478	9,612	3,845	5,963	600	4,518	2,019	
		3	911	237,779	9,025,695	6.4	0.75	43,323	37.7	1,633,290	653,316	16,333	6,533	11,880	1,178	7,676	3,430	
		No Action	911	272,497	10,343,532	6.4	0.75	49,649	37.7	1,871,766	748,706	18,718	7,487	15,564	1,525	8,797	3,931	
		No Action	911	163,108	6,191,308	6.4	0.75	29,718	26.1	775,647	310,259	7,756	3,103	3,904	403	3,646	1,629	
												0	0					
6	NE 70th To NE 124th	1	911	167,981	6,376,260	6.4	0.75	30,606	24.6	752,909	301,164	7,529	3,012	3,900	401	3,539	1,581	Average of North of NE 85th and South of NE 124th
		2	911	217,052	8,238,913	6.4	0.75	39,547	24.6	972,851	389,140	9,729	3,891	6,471	647	4,572	2,043	
		3	911	255,576	9,701,239	6.4	0.75	46,566	31.2	1,452,858	581,143	14,529	5,811	11,343	1,117	6,828	3,051	
		4	911	283,634	10,766,255	6.4	0.75	51,678	31.2	1,612,354	644,942	16,124	6,449	13,945	1,362	7,578	3,386	
		No Action	911	168,687	6,403,058	6.4	0.75	30,735	20.8	639,281	255,713	6,393	2,557	3,325	342	3,005	1,342	
												0	0					
7	NE 124th To SR 522	1	911	261,911	9,941,705	6.4	0.75	47,720	29.7	1,417,289	566,916	14,173	5,669	11,335	1,114	6,661	2,976	Average of South of NE 124th and South of Co. line
		2	911	352,314	13,373,252	6.4	0.75	64,192	29.7	1,906,491	762,596	19,065	7,626	20,417	1,964	8,961	4,004	
		3	911	419,739	15,932,593	6.4	0.75	76,476	40.8	3,120,239	1,248,096	31,202	12,481	39,727	3,783	14,665	6,553	
		4	911	470,608	17,863,495	6.4	0.75	85,745	40.8	3,498,387	1,399,355	34,984	13,994	49,881	4,722	16,442	7,347	
		No Action	911	262,651	9,969,794	6.4	0.75	47,855	27.2	1,301,656	520,663	13,017	5,207	10,439	1,026	6,118	2,733	
												0	0					
8	SR 522 To SR 527	1	911	108,463	4,117,075	6.4	0.75	19,762	21	415,001	166,000	4,150	1,660	1,408	154	1,951	872	Average of South of County line and South of SE 228th
		2	911	145,810	5,534,705	6.4	0.75	26,567	21	557,898	223,159	5,579	2,232	2,519	264	2,622	1,172	
		3	911	174,664	6,629,954	6.4	0.75	31,824	30	954,713	381,885	9,547	3,819	5,136	526	4,487	2,005	
		4	911	197,982	7,515,067	6.4	0.75	36,072	30	1,082,170	432,868	10,822	4,329	6,579	664	5,086	2,273	
		No Action	911	108,812	4,130,322	6.4	0.75	19,826	18	356,860	142,744	3,569	1,427	1,215	133	1,677	749	
												0	0					
9	SR 527 To SR 5	1	911	93,211	3,538,134	6.4	0.75	16,983	21.6	366,834	146,734	3,668	1,467	1,077	121	1,724	770	South of SR 524
		2	911	128,023	4,859,540	6.4	0.75	23,326	21.6	503,837	201,535	5,038	2,015	2,006	214	2,368	1,058	
		3	911	155,703	5,910,226	6.4	0.75	28,369	36	1,021,287	408,515	10,213	4,085	4,914	510	4,800	2,145	
		4	911	162,396	6,164,282	6.4	0.75	29,589	36	1,065,188	426,075	10,652	4,261	5,339	551	5,006	2,237	
		No Action	911	93,317	3,542,158	6.4	0.75	17,002	21.6	367,251	146,900	3,673	1,469	1,080	122	1,726	771	
	Alternative Totals											0	0					
		1		1,359,959				247,784	224.1	6,343,292	2,537,317	63,433	25,373	33,478	3,434	29,813	13,321	Totals
		2		1,867,195				340,203	224.1	8,713,464	3,485,386	87,135	34,854	61,802	6,141	40,953	18,298	
		3		2,283,785				416,106	331.5	15,604,076	6,241,630	156,041	62,416	132,721	12,981	73,339	32,769	
		4		2,544,143				463,543	331.5	17,420,464	6,968,185	174,205	69,682	165,724	16,072	81,876	36,583	
		No Action		1,366,717				249,016	210.1	5,961,398	2,384,559	59,614	23,846	31,513	3,232	28,019	12,519	

Note:
1. Wet hr/yr is obtained from WSDOT Water Quality Manual 1988
2. ADT was provided by Miria Associate
3. Hwy Length is provided by DEA

Appendix E

Impervious Areas by Alternative and Basin

Appendix E

New Impervious Surface Area Calculation Assumptions

The impervious area estimates for the I-405 Corridor Program are preliminary. As individual projects are developed, impervious area coverage will be refined. Nonetheless, in developing these estimates, each project was considered individually and effort was made to avoid double-counting as new impervious surface project pavement which would be overlaid upon existing impervious surface.

Roadway Improvements

Calculations were based on the width and length of the proposed roadway improvement. New lane additions were calculated at 12 feet of width. Road shoulder width requirements were estimated on a project-by-project basis. New shoulder widths varied from zero, where the existing shoulder was known to meet standards, up to 14 feet, where new shoulders would need to be added on both sides. Highway ramp widths were also estimated on an individual basis.

Non Motorized

Calculations were based on the width and length of the proposed improvement. The width of the improvements varied widely based on the proposed improvement. Where a bicycle lane would be added to an existing roadway 5 feet of new impervious width was assigned. At the other extreme, the development of a pedestrian/bicycle trail on a new alignment was assigned 21 feet of new impervious width.

Park and Ride, Transit Centers and Support Facilities

Calculations were based on the proposed size of the paved and building areas of the improvement. Park and Ride lots were based on 5 acres, Transit Centers on 2.5 acres and Support Facilities such as bus operating bases were sized individually.

High Capacity Transit

Impervious surface for the ballasted sections of rail was calculated at 50% of the ballasted surface area. Ballasted area was calculated as length times 38 feet of ballasted width. All other track and station platform facilities were calculated at 100% of their proposed surface area.

No-Action Alternative
Impervious Area by Basin

Element #															No Action
				Percentage	Length	Existing Paved	Existing Impervious	Existing Impervious	New Lanes	New Paved	New Impervious	New Impervious	Total Imperv.	Stream Basin	Alternative
	Jurisdiction	ACTIONS		per Sub Basin	in C/L Miles	Width	Total Basin Area - Acres	Sub Basin Area - Acres	Miles	Width	Total Basin Area - Acres	Sub Basin Area - Acres	Area Acres		5
	Redmond	T.PR-37	Bear Creek	100%			5.0	5.0				0.0	5.0	Bear	✓
	Renton	T.TC-6	Downtown Renton	100%			2.0	2.0				0.0	2.0	Cedar	✓
				60%			21.4	21.4			19.5	11.7	33.1	Cedar	✓
	Renton	T.PR-3	Renton Highlands											Cedar	✓
	Bellevue	T.PR-23	Newport (112th Ave. SE)	100%			5.0	5.0				0.0	5.0	Coal	✓
	Bellevue	R.IC-6	Coal Creek Pkwy I-405 to Factoria Blvd.	100%	0.5	50	3.6	3.6	0.5	20	1.3	1.3	4.9	Coal	✓
	Tukwila	T.PR-30	Tukwila	100%			5.0	5.0				0.0	5.0	Duwamish River	✓
	King County	T.PR-35	Lakemont	100%			5.0	5.0				0.0	5.0	East Lake Sammamish	✓
	Redmond	T.PR-36	Rendmond	100%			5.0	5.0				0.0	5.0	East Lake Sammamish	✓
	Bellevue	R-101	150th Ave SE---Widen to 7 lanes from SE 36th to SE 38th; add turn lanes	100%	0.7	72	7.3	7.3	0.7	33	0.7	0.7	8.0	East Lake Sammamish	✓
	Redmond	R-28	West Lake Sammamish Parkway (Leary Way to Bel-Red Rd)--- Widen to 4/5 lanes + CGS, bike lanes	100%			8.2	8.2			4.4	4.4	12.6	East Lake Sammamish	✓
	Kirkland	T.PR-31	Houghton	100%			5.0	5.0				0.0	5.0	East Lake Washington	✓
	Medina	T.PR-33	Evergreen Point	100%			5.0	5.0				0.0	5.0	East Lake Washington	✓
	Kirkland	T.TC-12	Downtown Kirkland	100%							2.0	2.0	2.0	East Lake Washington	✓
	Bell & Kirk	T.PR-20	South Kirkland	100%							5.0	5.0	5.0	East Lake Washington	✓
	Renton	R.HOV-32	Between Sunset and SR-900 /Park Ave interchange in Renton	100%							6	6.0	6.0	East Lake Washington	✓
	Redmond/	R-25	SR 202 Corridor Improvements(East Lake Sammamish Pkwy to Sahalee Way)--- Widen to 3/5 lanes; intersection	100%			9.8	9.8			9.3	9.3	19.1	Evans	✓
	Kirkland	T.PR-32	Kingsgate	100%			5.0	5.0				0.0	5.0	Juanita	✓
	Kirkland	R-21	NE 120 St (Slater Ave to 124 Ave NE)--- Construct new 3-lane roadway with ped/bike facilities	100%				0.0				0.0	0.0	Juanita	✓
	Kirkland	T.TC-14	Totem Lake	100%							2.0	2.0	2.0	Juanita	✓
	KCDOT	R-40	Juanita-Woodinville Way (NE 145 St to 112th Ave NE) Widen to 5 lanes + CGS, walkway/pathway	100%			3.3	3.3			2.1	2.1	5.4	Juanita	✓
	ST	R.HOV-66	I-405 at NE 128th St/HOV Direct Access Improvements	100%							6.3	6.3	6.3	Juanita	✓
	Redmond	T.PR-21	Overlake	100%			5.0	5.0				0.0	5.0	Kelsey	✓
	Bellevue	R-08	NE 29th Pl (148th Ave NE to NE 24th St)/Construct new 2-lane road	100%	0.7		0.0	0.0	2.8	12	0.0	0.0	0.0	Kelsey	✓
	Woodinville	T.PR-41	Woodinville	100%			5.0	5.0				0.0	5.0	Little Bear	✓
	ST	HOV-102, R.HOV.58 &	Woodinville Arterial Enhancements/HOV arterial enhancements	100%			5.6	5.6			1	1.0	6.6	Little Bear	✓
	Woodinville	R-51	Woodinville-Snohomish Rd/140 Ave NE (NE 175 St to SR 522)--- Widen to 4/5 lanes + CGS, bike lanes	100%			9.8	9.8			13.6	13.6	23.4	Little Bear	✓
	Renton	R.HOV-33 & R.IC.12	NE 44th I/C - HOV Direct Access and Arterial Improvements(Assumes Port Quendall)	100%							9.1	9.1	9.1	May	✓
	Mercer Island	T.PR-42	Mercer Island	100%			5.0	5.0				0.0	5.0	Mercer Isaland	✓
	Bothell	T.PR-25	Canyon Park (SR 405 and SR 527)	100%			5.0	5.0				0.0	5.0	North	✓
	Bothell	R.HOV-63	SR 527	100%							1	1.0	1.0	North	✓
	Snohomish Co.	R-117	39th Ave SE Realignment at SR 524 and York Rd--- Construct 4-way intersection to replace 2 offset intersections	100%			1.1	1.1			1.1	1.1	2.2	North	✓
	Bothell, Snohomish C	R.AC-21	120th NE/39th SE - NE 95th to Maltby Rd - 4/5 lanes including new connection	100%			5.6	5.6			7.8	7.8	13.4	North	✓
				80%							11.5	9.2	9.2	North	✓
				60%			10.5	6.3			22.9	13.7	20.0	North	✓
	KC	T.PR-24	NE 160th/Brickyard Rd	100%			5.0	5.0				0.0	5.0	Sammamish River	✓
	Redmond	T.TC-9	Overlake	100%			2.0	2.0				0.0	2.0	Sammamish River	✓
	Redmond	R-111 & R.AC.15	Willows Rd Corridor Improvements-- Channelization of Willows Rd/Redmond Way intersection and widening of	100%			1.2	1.2			0.7	0.7	1.9	Sammamish River	✓
	Renton	R-36	Oakesdale Ave SW (SW 31st to SW 16th)--- Construct new 5 lane roadway with CGS	100%			2.1	2.1			3.0	3.0	5.1	Sammamish River	✓
	Redmond	R-26	NE 90 St (Willows Rd to SR 202)--- Construct new 4/5 lanes + bike facilities	100%			1.4	1.4			4.0	4.0	5.4	Sammamish River	✓
	KCDOT	R-47	NE 124 St (Willows Rd to SR 202)--- Widen to 4/5 lanes + CGS, bike facilities; traffic signal.	100%			4.4	4.4			5.5	5.5	9.9	Sammamish River	✓
	Bothell	R.HOV-62	SR 522 Campus Access	100%							5.7	5.7	5.7	Sammamish River	✓
	KCDOT	R-39 & R.AC.2	140 Ave SE (SR 169 to SE 208 St)--- Widen to 5 lanes SR 169 to SE 196 St, widen for turn channEast Lake Sammamish on	40%			21.4	8.6			19.5	7.8	16.4	Soos	✓
	Bellevue	T.PR-22	South Bellevue	100%			5.0	5.0				0.0	5.0	South Kelsey	✓
	Bellevue	T.PR-34	Wilburton	100%			5.0	5.0				0.0	5.0	South Kelsey	✓
	Bellevue	T.PR-43	Eastgate	100%			5.0	5.0				0.0	5.0	South Kelsey	✓
	Bellevue	T.TC-8	Downtown Bellevue	100%			2.0	2.0				0.0	2.0	South Kelsey	✓
	Bellevue	HOV-01	I-405 at NE 4th/6th/8th (Bellevue) / Construct new HOV direct access at NE 6th, Improve arterial capacity at NE	100%							6.1	6.1	6.1	South Kelsey	✓
	Bellevue	HOV-02	I-90 (Eastgate) / New I-90 HOV direct access connection to P&R	100%							6.3	6.3	6.3	South Kelsey	✓
	Renton	R.BI.1	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167	100%	1.2				0.2	28	0.7	0.7	0.7	Spring Brook	✓
	Tukwila & Ren	T.PR-6	Tukwila Commuter Rail (Longacres)	100%							5.0	5.0	5.0	Spring Brook	✓
	Bothell	T.PR-38	Bothell	100%			5.0	5.0				0.0	5.0	Swamp	✓
	Kenmore	T.PR-39	Northshore	100%			5.0	5.0				0.0	5.0	Swamp	✓
	Kenmore	T.PR-40	Kenmore	100%			5.0	5.0				0.0	5.0	Swamp	✓
	WSDOT	HOV-14	I-405 (I-5 Swamp Creek to SR 527)/Construct NB and SB HOV lanes total 6 lanes	20%	3.6				7.2	12	11.5	2.3	2.3	Swamp	✓
	Snohomish Co.	R-10	SR 524 (24 St SW to SR 527)--- Widen to 4/5 lanes including sidewalks, bike lanes	40%			10.5	4.2			22.9	9.2	13.4	Swamp	✓
	Various	TS 0	Twenty percent more service than in the proposed 6-year plans for sound Transit, METRO and Community Transit	100%							9.3	9.3	9.3		✓
	TOTAL											**172.9**	**377.8**		**57.0**

Alternative 1
Impervious Surface by Basin

I-405 Corridor Program

EIS Alternatives Impervious Surface

	Jurisdiction	ACTIONS		Percentage per Sub Basin	Length in C/L Miles	Existing Paved Width	Existing Impervious Total Basin Area - Acres	Existing Impervious Sub Basin Area - Acres	New Lanes Miles	New Paved Width	New Impervious Total Basin Area - Acres	New Impervious Sub Basin Area - Acres	Total Imperv. Area Acres	Stream Basin	Alternative 1
Element #															HCT/TDM
	Redmond	R.HOV-47	Avondale Rd from Novelty Hill Rd to Avondale Way/ Construct SB HOV lane	100%			8.6	8.6			1.5	1.5	10.1	Bear	✓
				16%							27.3	4.4	4.4	Bear	✓
	Renton	R.HOV-43 & R.IC-4	SR 169 from SR 405 to Riverview Park Vicinity - HOV/Transit Preferential treatment.	100%			8	8.0			1.4	1.4	9.4	Cedar	✓
	Renton	R.HOV-49	Logan Ave N/N 6 St from S 3 St to Park Dr, Transit Signal Priority	100%			0	0.0			0.0	0.0	0.0	Cedar	✓
	Renton	T.HCT-2	HCT-Renton CBD to NE 44th (Port Quendall)	20%							8.5	1.7	1.7	Cedar	✓
	K C	T.PR-8	SR 169 and 140th Place SE	100%							5.0	5.0	5.0	Cedar	✓
	K C	T.PR-9	Petrovitsky Rd and 157th Ave SE	100%							5.0	5.0	5.0	Cedar	✓
	Renton	NM.P&B-14	Cedar River Trail S. Extension - I-405 to Burnett Ave - Add ped/bike facilities	100%					0.1	10	0.0	0.0	0.0	Cedar	✓
	Bellevue	R.BI.4	I-90 / Coal Creek Interchange	100%				0.0	1.6	50	10.7	10.7	10.7	Coal	✓
	Bellevue	R.HOV-36	Coal Creek Pkwy from I-405 to Forest Drive	100%	0.1		0	0.0	0.1	12	0.2	0.2	0.2	Coal	✓
				17%							8.3	1.4	1.4	Coal	✓
				67%							10.1	6.8	6.8	East Lake Sammamish	✓
				50%							3.4	1.7	1.7	East Lake Washington	✓
				60%			2	1.2			0.5	0.3	1.5	East Lake Washington	✓
	Kirkland, Bellevue	R.HOV-56	Lake Washington Blvd (SR 520 to Yarrow Bay) - HOV lanes	100%			6.4	6.4			1.3	1.3	7.7	East Lake Washington	✓
	Kirkland	R.HOV-57	NE 68 St/NE 72 Pl (I-405 Vicinity) Que Bypass'	100%			1	1.0			0.2	0.2	1.2	East Lake Washington	✓
				39%							8.5	3.3	3.3	East Lake Washington	✓
	Ren< New & Bel	T.HCT-3	HCT- NE 44th (Port Quendall) to Factoria	66%							8.3	5.5	5.5	East Lake Washington	✓
	Bell & Kirk	T.HCT-7	HCT- Bellevue to Totem Lake	50%							20.6	10.3	10.3	East Lake Washington	✓
	Renton	NM. CR-5	NE Park Drive - crossing I-405 from SR-900/Sunset Blvd to Lake Wash Blvd - Add sidewalk/paved shoulder	100%				0.0	0.8	13.5	0.0	0.0	0.0	East Lake Washington	✓
				60%	7.9						12.6	7.6	7.6	East Lake Washington	✓
	Bellevue	NM.P&B-4	Lk Washington Blvd - SR 405 to SE 60th - Add ped/bike facilities	100%	0.5	20	1.5	1.5	0.5	16	0.1	0.1	1.6	East Lake Washington	✓
	Bel,Nwcas,Ren	NM.P&B-6	Lk Washington Blvd/112th - SE 60th to May Creek I/C - Add ped/bike facility	100%	0.5	20	1.5	1.5	0.5	15	0.1	0.1	1.6	East Lake Washington	✓
	Kirkland	R.BI.2	Continue NB climbing Lane from NE 70th to NE 85th and continue as auxiliary Lane to NE 116th	100%	2.5			0.0	2.5	12	4	4.0	4.0	Forbes	✓
	Kirkland	R.BI.3	SB auxiliary Lane NE 124th to NE 85th	100%	1.3			0.0	1.3	12	2.1	2.1	2.1	Forbes	✓
				50%			12.8	6.4			2.3	1.2	7.6	Forbes	✓
	Bellevue,Kirkland	NM.P&B-2	BNSF Right of Way - SE 8th to Totem Lake - Add ped/bike facility.	10%	7.9		0.0	0.0	7.9	12	12.6	1.3	1.3	Forbes	✓
				32%							20.6	6.6	6.6	Forbes	✓
				69%							4	2.8	2.8	Juanita	✓
	Kirkland	R.HOV-39	NE 116th from 115th Ave NE to 124th Ave NE	100%			5.2	5.2			1.0	1.0	6.2	Juanita	✓
	Kirkland	R.HOV-40	NE 124th from 113th Ave NE to 132 Ave NE	100%			3.9	3.9			0.7	0.7	4.6	Juanita	✓
				18%							20.6	3.7	3.7	Juanita	✓
				62%							17.0	10.5	10.5	Juanita	✓
	Bell & Red	T.HCT-6	HCT - Bellevue to Redmond	50%							27.3	13.7	13.7	Kelsey	✓
	Tuk. & Renton	T.HCT-1	HCT- SeaTac to Renton CBD	20%							20.9	4.2	4.2	Lower Green River	✓
	Renton/Tukwila	NM.P&B-18	I-405/I-5 - via or around I-405/I-5 interchange - Add ped/bike facilities	100%					0.5	10	0.0	0.0	0.0	Lower Green River	✓
	Renton	R.BI.7	Kennydale Hill climbing lane - SR 900 to 44th - NB 900 to 30th, SB 44th - 30th	50%	2.1			0.0	2.1	12	3.4	1.7	1.7	May	✓
	Renton	R.HOV-51	Park Dr/Sunset Blvd from Garden Ave to Duvall Ave NE, Que Bypass'	40%			2	0.8			0.5	0.2	1.0	May	✓
				41%							8.5	3.5	3.5	May	✓
	Bothell	R.BI.6	NB auxiliary lane Sr 522 to SR 527	100%	3			0.0	3.0	12	4.8	4.8	4.8	North	✓
	Bothell	R.HOV-41	SR 527 From SE 228th St to SR 524	100%			12.7	12.7			3.8	3.8	16.5	North	✓
				89%							12.4	11.0	11.0	North	✓
	Bothell	NM. CR-2	Fitzgerald Rd/27th Ave. - crossing I-405 from 228th St. SE to 240th St. SE - Add ped/bike facility	100%			0.0	0.0			1.9	1.9	1.9	North	✓
	Sno. County	NM. CR-4	Damson Road - crossing I-405 from 192nd St SW to Logan Rd - Add sidewalk/paved shoulder	100%			0.0	0.0			2.8	2.8	2.8	North	✓
	Bothell	NM. CR-7	Connection between Sammamish River Trail and North Creek Trail - between SR-522 and NE 195th St. - Add	100%			0.0	0.0			1.2	1.2	1.2	North	✓
	Bothell	NM. CR-8	SR-527 - crossing I-405 from 220th St SE to 228th St SE - ped/bike facility	100%			0.0	0.0			1.4	1.4	1.4	North	✓
	Bothell	NM.P&B-5	North Creek Trail Link - 240th to 232nd - Add ped/bike trail.	100%			0.0	0.0			0.6	0.6	0.6	North	✓
	Kenmore	R.HOV-53 & R.PA.11	68 Ave NE (Simonds Rd to SR 522) - Construct NB HOV lane	45%			4.5	2.0			0.5	0.2	2.3	North Lake Washington	✓
	Both,King Co,Kirk	R.BI.5	SB SR 522 to 124th continue climbing lane as an auxiliary lane	35%	2.5			0.0	2.5	12	4	1.4	1.4	Sammamish River	✓
	Kirk, Redmond	R.HOV-38	NE 85th St from Kirkland Way to 148th Ave NE Vicinity	50%			12.8	6.4			2.3	1.2	7.6	Sammamish River	✓
				55%			4.5	2.5			0.5	0.3	2.8	Sammamish River	✓
	Redmond	R.HOV-55	Willows Rd (Redmond Wy to NE 124 St)	100%			3.3	3.3			0.7	0.7	4.0	Sammamish River	✓
				34%							27.3	9.3	9.3	Sammamish River	✓
	Kirk & King Co	T.HCT-8	HCT - Totem Lake to Bothell	38%							17.0	6.5	6.5	Sammamish River	✓
	Redmond	T.PR-17	Willows Rd @ NE 100th	100%							5.0	5.0	5.0	Sammamish River	✓
	Redmond	T.PR-18	SR 202 @ NE 100th	100%							5.0	5.0	5.0	Sammamish River	✓
	KC	T.PR-26	SR 202 @ NE 145th					0.0				0.0		Sammamish River	✓
				50%			10.8	5.4			4.1	2.1	7.5	Soos	✓
	K C	T.PR-10	140th Ave SE and SE 192nd	100%							5.0	5.0	5.0	Soos	✓
	Bellevue	R.BI.8	I-90 to Bellevue SB HOV direct connection to I-90 west	100%				0.0	0.6	12	1	1.0	1.0	South Kelsey	✓
	Bellevue	R.BI.9	NB auxiliary lane I-90 to NE 8th	100%	2.7			0.0	1.5	16	3.2	3.2	3.2	South Kelsey	✓
	Bellevue	R.BI.10	Increase SR 405 to Eastbound SR 520 Ramp capacity	100%				0.0	3.0	20	8	8.0	8.0	South Kelsey	✓
	Bellevue	R.HOV-37	NE 8th Street from I-405 to 120th Ave NE	100%	0.2	92	2.7	2.7	0.2	18	0.5	0.5	3.2	South Kelsey	✓
	Bellevue	R.HOV-60	Bellevue Way - I-90 to South Bellevue Park and Ride Vicinity	100%	0.1	70	1	1.0	0.1	22	0.3	0.3	1.3	South Kelsey	✓
				17%							8.3	1.4	1.4	South Kelsey	✓
	Bell & Issa	T.HCT-4	HCT - Factoria To Issaquah	33%							10.1	3.3	3.3	South Kelsey	✓
	Bellevue	T.HCT-5	HCT Factoria to Downtown Bellevue	100%							13.3	13.3	13.3	South Kelsey	✓
	Bellevue	NM. CR-1	Lk Washington Blvd/112th Ave. SE - crossing I-405 from 106th Ave. SE to 112th Place SE - Add sidewalks	100%	0.1	30	0.4	0.4	0.1	12	0.0	0.0	0.4	South Kelsey	✓
				30%	7.9						12.6	3.8	3.8	South Kelsey	✓
	Renton	R.BI.1	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167	100%	1.2			0.0	1.5	14	2.8	2.8	2.8	Spring Brook	✓
	Renton	R.BI.14	NB Auxilliary Lane I-5 to SR 167	100%	3.2			0.0	3.2	12	5.1	5.1	5.1	Spring Brook	✓
	Renton	R.HOV-44	SW 27th St Corridor in Renton from Oaksdale Ave to SR 167	100%			4.3	4.3			6.7	6.7	11.0	Spring Brook	✓
	Renton, King Co	R.HOV-48	SW 43 St from SR 167 to 140 Ave SE	50%			10.8	5.4			4.1	2.1	7.5	Spring Brook	✓
				80%							20.9	16.7	16.7	Spring Brook	✓
		T.HCT-10	HCT- Rail Maintenance and Storage Facility	100%							28.4	28.4	28.4	Spring Brook	✓
	K C	T.PR-11	SR 515 and SE 208th	100%							5.0	5.0	5.0	Spring Brook	✓
	Kent & Renton	T.PR-12	SR 167 and SW 43rd	100%							5.0	5.0	5.0	Spring Brook	✓
	Kent & Renton	T.PR-13	SR 167 and 84th Ave	100%							5.0	5.0	5.0	Spring Brook	✓
	Renton	NM. CR-6	Jackson SW/Longacres Dr SW - crossing I-405 from S. Longacres Way to Monster Rd SW - Add sidewalk/paved	100%				0.0	0.5	13.5	0.0	0.0	0.0	Spring Brook	✓
	Renton	NM.P&B-16	Cedar-Duwamish Trail Connection - I-405 to Interurban Ave. S. - Add ped/bike facilities	100%					0.5	10	0.0	0.0	0.0	Spring Brook	✓
	Renton	NM.P&B-17	I-405/SR-167 trail connection - Lind Ave. SE to Talbot Rd S. - Add trail connection	100%					0.8	10	0.0	0.0	0.0	Spring Brook	✓
	Tukwila	NM.P&B-19	SR-181/W. Valley Hwy - crossing I-405 from Strander Blvd to Fort Dent Way - Add bike lanes	100%					1.5	10	0.0	0.0	0.0	Spring Brook	✓
	Various	T.HCT-9	HCT - Bothell to Lynnwood	11%							12.4	1.4	1.4	Swamp	✓
	King County	NM. CR-3	SR-524 (Filbert Road) - crossing I-405 from North Rd to Locust Way - Add sidewalk/paved shoulder	100%			0.0	0.0			1.9	1.9	1.9	Swamp	✓
	Renton	NM.P&B-15	Cedar River Trail/Lake Washington Blvd Connector - Cedar River Trail to Lk Wash Blvd Loop - Add ped/bike	50%					0.9	10	1.1	0.6	0.6	WLW	✓
	TOTAL											**304.9**	**395.5**		**85.0**

Alternative 1
Impervious Surface by Basin

Alternative 2
Impervious Area by Basin

I-405 Corridor Program

EIS Alternatives Impervious Surface

	Jurisdiction	*ACTIONS*		*Percentage per Sub Basin*	*Length in C/L Miles*	*Existing Paved Width*	*Existing Impervious Total Basin Area - Acres*	*Existing Impervious Sub Basin Area - Acres*	*New Lanes Miles*	*New Paved Width*	*New Impervious Total Basin Area - Acres*	*New Impervious Sub Basin Area - Acres*	*Total Imperv. Area Acres*	*Stream Basin*	*Alternative 2*
Element #															**Mixed Mode with HCT/Transit Emphasis**
	Redmond	R.HOV-47	Avondale Rd from Novelty Hill Rd to Avondale Way/ Construct SB HOV lane	100%			8.6	8.6			1.5	1.5	10.1	Bear	✓
				16%							27.3	4.4	4.4	Bear	✓
	KCDOT	R.PA-8	NE 124/128 St (SR 202 to Avondale Rd)--- Widen to 4/5 lanes including bike & equestrian facilities (ETP 164)	50%			9.9	5.0			3.2	1.6	6.6	Bear	✓
	Redmond	R.PA-17	Bear Creek Pkwy--- Construct new 162nd Ave NE arterial and new 72nd St arterial w/ bike/ped and CSG; widen	100%			3.2	3.2			4.2	4.2	7.4	Bear	✓
	Redmond	R.PA-18	Union Hill Rd (Avondale Rd to 196 Ave NE)--- Widen to 4/5 lanes with bike facilities (ETP R-27)	50%			5.8	2.9			6.1	3.1	6.0	Bear	✓
	WSDOT	R.PA-27	SR 520/SR 202 Interchange --- Complete interchange by constructing a new ramp and thru lane on 202 to SR 520	100%			16.5	16.5			7.8	7.8	24.3	Bear	✓
	Renton	R.TC-10	One additional GP lanes in each direction - SR 167 to SR 900/North Renton I/C	55%	2.2	108	34.6	19.0	4.4	12	7	3.9	22.9	Cedar	✓
	Renton	R.IC-4 & R.HOV-43	SR 169 Maple Valley Hwy SR 900 to NE 5th See R.HOV-43	100%										Cedar	✓
	Renton	R.HOV-43 & R.IC-4	SR 169 from SR 405 to Riverview Park Vicinity - HOV/Transit Preferential treatment.	100%			8	8.0			1.4	1.4	9.4	Cedar	✓
	Renton	R.HOV-49	Logan Ave N/N 6 St from S 3 St to Park Dr, Transit Signal Priority	100%			0	0.0			0.0	0.0	0.0	Cedar	✓
	Renton	T.HCT-2	HCT-Renton CBD to NE 44th (Port Quendall)	20%							8.5	1.7	1.7	Cedar	✓
	K C	T.PR-8	SR 169 and 140th Place SE	100%							5.0	5.0	5.0	Cedar	✓
	K C	T.PR-9	Petrovitsky Rd and 157th Ave SE	100%							5.0	5.0	5.0	Cedar	✓
	Renton	NM.P&B-14	Cedar River Trail S. Extension - I-405 to Burnett Ave - Add ped/bike facilities	100%					0.1	10	0.0	0.0	0.0	Cedar	✓
	Renton	R.PA-19	Duvall Ave NE (NE 4 St to NE 25 Court -City Limits)--- Widen to 5 lanes + CGS, bikeway (ETP R-31)	100%			8.5	8.5			4.2	4.2	12.7	Cedar	✓
	Bellevue	R.BI.4	I-90 / Coal Creek Interchange	100%				0.0	1.6	50	10.7	10.7	10.7	Coal	✓
	Bellevue	R.HOV-36	Coal Creek Pkwy from I-405 to Forest Drive	100%	0.1		0	0.0	0.1	12	0.2	0.2	0.2	Coal	✓
	Newcastle	R.PA-15	Coal Creek Pkwy (SE 72 St to Renton City Limits)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signals (ETP R-	25%	1.6	32	7.4	1.9	3.2	12	5.1	1.3	3.1	Coal	✓
				17%							8.3	1.4	1.4	Coal	✓
	Renton	R.PA-20	Oakesdale Ave SW (Monster Rd to SR 900) Replace Monster Rd Bridge; widen to 4/5 lanes +Bike Lanes + CGS	50%			2.9	1.5			3.2	1.6	3.1	Duwamish River	✓
	Renton	R.PA-21	Rainier Ave / Grady Way (intersection)-- Grade separation	100%							0.2	0.2	0.2	Duwamish River	✓
				67%							10.1	6.8	6.8	East Lake Sammamish	✓
				50%							3.4	1.7	1.7	East Lake Washington	✓
	Ren, Nwcas,Bel	R.TC-11	One additional GP lanes in each direction - SR 900/North Renton I/C to SR 90	37%	5.6	108	88	32.6	11.2	12	17.9	6.6	39.2	East Lake Washington	✓
				43%			88	37.8			17.9	7.7	45.5	East Lake Washington	✓
	Bellevue,Kirkland	R.TC-13	One additional GP lanes in each direction - SR 520 to NE 70th (Varify need for additional through capacity on this	100%	2.9	144	60.7	60.7	5.8	12	9.3	9.3	70.0	East Lake Washington	✓
	Newcastle	R.HOV-65	112th St SE (In-Line Station)	100%					0.4	12	0.6	0.6	0.6	East Lake Washington	✓
				60%			2	1.2			0.5	0.3	1.5	East Lake Washington	✓
	Kirkland, Bellevue	R.HOV-56	Lake Washington Blvd (SR 520 to Yarrow Bay) - HOV lanes	100%			6.4	6.4			1.3	1.3	7.7	East Lake Washington	✓
	Kirkland	R.HOV-57	NE 68 St/NE 72 Pl (I-405 Vicinity) Que Bypass'	100%			1	1.0			0.2	0.2	1.2	East Lake Washington	✓
				39%							8.5	3.3	3.3	East Lake Washington	✓
	Ren< New & Bel	T.HCT-3	HCT- NE 44th (Port Quendall) to Factoria	66%							8.3	5.5	5.5	East Lake Washington	✓
	Bell & Kirk	T.HCT-7	HCT- Bellevue to Totem Lake	50%							20.6	10.3	10.3	East Lake Washington	✓
	Renton	NM. CR-5	NE Park Drive - crossing I-405 from SR-900/Sunset Blvd to Lake Wash Blvd - Add sidewalk/paved shoulder	100%				0.0	0.8	13.5	0.0	0.0	0.0	East Lake Washington	✓
				60%	7.9						12.6	7.6	7.6	East Lake Washington	✓
	Bellevue	NM.P&B-4	Lk Washington Blvd - SR 405 to SE 60th - Add ped/bike facilities	100%	0.5	20	1.5	1.5	0.5	16	0.1	0.1	1.6	East Lake Washington	✓
	Bel,Nwcas,Ren	NM.P&B-6	Lk Washington Blvd/112th - SE 60th to May Creek I/C - Add ped/bike facility	100%	0.5	20	1.5	1.5	0.5	15	0.1	0.1	1.6	East Lake Washington	✓
				50%			5.8	2.9			6.1	3.1	6.0	Evans	✓
	Kirkland	R.BI.2	Continue NB climbing Lane from NE 70th to NE 85th and continue as auxiliary Lane to NE 116th	100%	2.5			0.0	2.5	12	4	4.0	4.0	Forbes	✓
	Kirkland	R.BI.3	SB auxiliary Lane NE 124th to NE 85th	100%	1.3			0.0	1.3	12	2.1	2.1	2.1	Forbes	✓
				60%			49.9	29.9			8.3	5.0	34.9	Forbes	✓
				45%			5.2	2.3			1.8	0.8	3.2	Forbes	✓
				50%			5.5	2.8			1.9	1.0	3.7	Forbes	✓
				50%			12.8	6.4			2.3	1.2	7.6	Forbes	✓
	Bellevue,Kirkland	NM.P&B-2	BNSF Right of Way - SE 8th to Totem Lake - Add ped/bike facility.	10%	7.9		0.0	0.0	7.9	12	12.6	1.3	1.3	Forbes	✓
	Kirkland	R.PA-12	124 Ave NE (NE 85 St to Slater Rd NE)--- Widen to 3 lanes (s. of NE 116th St, 5 lanes n. of NE 116th St with	100%			4.7	4.7			1.1	1.1	5.8	Forbes	✓
	Kirkland	R.PA-14	NE 100 St (117 Ave NE to Slater Ave) --- Construct bike/pedestrian/emergency Vehicle overpass across I-405 (ETP	100%			0.0	0.0			0.3	0.3	0.3	Forbes	✓
				32%							20.6	6.6	6.6	Forbes	✓
				69%							4	2.8	2.8	Juanita	✓
	Kirkland	R.TC-14	One additional GP lanes in each direction - NE 70th to NE 124th	40%	2.6	132	49.9	20.0	5.2	12	8.3	3.3	23.3	Juanita	✓
				60%			65.3	39.2			10.9	6.5	45.7	Juanita	✓
	Kirkland	R.IC-9	NE 116th- 114th Ave NE to 124th Ave NE	50%			5.5	2.8			1.9	1.0	3.7	Juanita	✓
	Kirkland	R.IC-10	NE 124th- 113th Ave NE to 124th Ave NE	100%			5.4	5.4			1.8	1.8	7.2	Juanita	✓
	Kirkland	R.HOV-39	NE 116th from 115th Ave NE to 124th Ave NE	100%			5.2	5.2			1.0	1.0	6.2	Juanita	✓
	Kirkland	R.HOV-40	NE 124th from 113th Ave NE to 132 Ave NE	100%			3.9	3.9			0.7	0.7	4.6	Juanita	✓
				18%							20.6	3.7	3.7	Juanita	✓
				62%							17.0	10.5	10.5	Juanita	✓
	Kirkland	R.PA-13 & R.IC-26	NE 132 St (100 Ave NE to 116 Way NE)--- Widen to 3 lanes + CGS, Bike lane (ETP R-124) See R.IC-26	100%				0.0			0.0	0.0	0.0	Juanita	✓
	Bell & Red	T.HCT-6	HCT - Bellevue to Redmond	50%							27.3	13.7	13.7	Kelsey	✓
				45%			32	14.4			8	3.6	18.0	Little Bear	✓
	Tukwila	R.CF.1	SR 518 I-405 to SR 99/Airport Access	100%	1.9	78	21.6	21.6	3.8	12	6.1	6.1	27.7	Lower Green River	✓
	Tukwila	R.CF.9	I-5 at Tukwila	50%	3.3	148	71	35.5	3.3	12	5.3	2.7	38.2	Lower Green River	✓
				20%			50.3	10.1			10.2	2.0	12.1	Lower Green River	✓
	Tukwila	R.HOV-25	SR 5 I/C @ Tukwila Fwy to Fwy HOV ramps,	100%							19.4	19.4	19.4	Lower Green River	✓
	Tuk. & Renton	T.HCT-1	HCT- SeaTac to Renton CBD	20%							20.9	4.2	4.2	Lower Green River	✓
	Renton/Tukwila	NM.P&B-18	I-405/1-5 - via or around I-405/I-5 interchange - Add ped/bike facilities	100%					0.5	10	0.0	0.0	0.0	Lower Green River	✓
	Renton	R.BI.7	Kennydale Hill climbing lane - SR 900 to 44th - NB 900 to 30th, SB 44th - 30th	50%	2.1			0.0	2.1	12	3.4	1.7	1.7	May	✓
	Renton	R.HOV-51	Park Dr/Sunset Blvd from Garden Ave to Duvall Ave NE, Que Bypass'	40%			2	0.8			0.5	0.2	1.0	May	✓
				41%							8.5	3.5	3.5	May	✓
				75%			7.4	5.6			5.1	3.8	9.4	May	✓
	Bothell	R.BI.6	NB auxiliary lane Sr 522 to SR 527	100%	3			0.0	3.0	12	4.8	4.8	4.8	North	✓
	Bothell,Sno Co	R.TC-16	One additional GP lanes in each direction - SR 522 to SR 527	100%	3	112	48.9	48.9	6.0	12	9.6	9.6	58.5	North	✓
	Sno. Co	R.TC-17	One additional GP lanes in each direction - SR 527 to SR 5 Swamp Creek	80%	3.6	112	58.6	46.9	7.2	12	11.5	9.2	56.1	North	✓
	Bothell	R.IC-11	SR 527-228th to SR 524	100%			12.7	12.7			2.4	2.4	15.1	North	✓
	Bothell	R.HOV-29	SR 522 Fwy to Fwy HOV Ramps	100%							12.9	12.9	12.9	North	✓
	Bothell	R.HOV-41	SR 527 From SE 228th St to SR 524	100%			12.7	12.7			3.8	3.8	16.5	North	✓
				89%							12.4	11.0	11.0	North	✓
	Bothell	NM. CR-2	Fitzgerald Rd/27th Ave. - crossing I-405 from 228th St. SE to 240th St. SE - Add ped/bike facility	100%			0.0	0.0			1.9	1.9	1.9	North	✓
	Sno. County	NM. CR-4	Damson Road - crossing I-405 from 192nd St SW to Logan Rd - Add sidewalk/paved shoulder	100%			0.0	0.0			2.8	2.8	2.8	North	✓
	Bothell	NM. CR-7	Connection between Sammamish River Trail and North Creek Trail - between SR-522 and NE 195th St. - Add	100%			0.0	0.0			1.2	1.2	1.2	North	✓
	Bothell	NM. CR-8	SR-527 - crossing I-405 from 220th St SE to 228th St SE - ped/bike facility	100%			0.0	0.0			1.4	1.4	1.4	North	✓
	Bothell	NM.P&B-5	North Creek Trail Link - 240th to 232nd - Add ped/bike trail.	100%			0.0	0.0			0.6	0.6	0.6	North	✓
	Bothell	R.PA-4	SR 524 (SR 527 to Bothell City Limit)--- Widen to 5 lanes + CGS, bike facilities (class III) (ETP R-11)	100%			5.1	5.1			8.9	8.9	14.0	North	✓
	Kenmore	R.HOV-53 & R.PA.11	68 Ave NE (Simonds Rd to SR 522) - Construct NB HOV lane	45%			4.5	2.0			0.5	0.2	2.3	North Lake Washington	✓
	Bothell	R.PA-3	SR 522 Multimodal Corridor Project--- Widen SR-522 mostly within existing ROW to provide transit lanes, safety	20%			0.0	0.0			1.1	0.2	0.2	North Lake Washington	✓
	Both,King Co,Kirk	R.BI.5	SB SR 522 to 124th continue climbing lane as an auxiliary lane	35%	2.5			0.0	2.5	12	4	1.4	1.4	Sammamish River	✓
	Bothell, Woodin	R.CF.5	SR 522 Bothell to NE 195th	55%	2.5	88	32	17.6	5.0	12	8	4.4	22.0	Sammamish River	✓
	Kirk,K C,Both	R.TC-15	One additional GP lanes in each direction - NE 124th SR 522	40%	3.4	132	65.3	26.1	6.8	12	10.9	4.4	30.5	Sammamish River	✓
	Kirkland, Redmond	R.IC-8	NE 85th St-Kirkland Way to 124th	55%			5.2	2.9			1.8	1.0	3.9	Sammamish River	✓
	Bothell	R.IC-24 & R-40	NE 160th Street-112th Ave to Juanita/Woodinville Wy See R-40	100%				0.0			0.0	0.0	0.0	Sammamish River	✓
	Kirk, Redmond	R.HOV-38	NE 85th St from Kirkland Way to 148th Ave NE Vicinity	50%			12.8	6.4			2.3	1.2	7.6	Sammamish River	✓
				55%			4.5	2.5			0.5	0.3	2.8	Sammamish River	✓
	Redmond	R.HOV-55	Willows Rd (Redmond Wy to NE 124 St)	100%			3.3	3.3			0.7	0.7	4.0	Sammamish River	✓
				34%							27.3	9.3	9.3	Sammamish River	✓
	Kirk & King Co	T.HCT-8	HCT - Totem Lake to Bothell	38%							17.0	6.5	6.5	Sammamish River	✓

Alternative 2
Impervious Area by Basin

	Redmond	T.PR-17	Willows Rd @ NE 100th	100%							5.0	5.0	5.0	Sammamish River	✓
	Redmond	T.PR-18	SR 202 @ NE 100th	100%							5.0	5.0	5.0	Sammamish River	✓
	KC	T.PR-26	SR 202 @ NE 145th					0.0				0.0		Sammamish River	✓
	Bellevue	R.PA-2	148 Ave SE (SE 24 St to SE 28 St) New SB lane from SE 24 St to the WB I-90 on-ramp (ETP 203)	100%	0.5	72	5.2	5.2	0.5	12	0.7	0.7	5.9	Sammamish River	✓
				80%			0.0	0.0			1.1	0.9	0.9	Sammamish River	✓
				50%			9.9	5.0			4.7	2.4	7.3	Sammamish River	✓
	KCDOT	R.PA-10	NE 132 St Extension (132 Ave NE to Willows Rd Ext.)--- Construct new 3 lane arterial with CGS, bike lanes (ETP	100%			0.0	0.0			2.1	2.1	2.1	Sammamish River	✓
	Kenmore/KCDOT	R.PA-11 & R.HOV.53	68 Ave NE (Simonds Rd to SR 522)--- Construct NB HOV lane total of 5/6 lanes (ETP 22) See R.HOV-53	100%				0.0			0.0	0.0	0.0	Sammamish River	✓
	Redmond	R.PA-16	Redmond 148th Ave NE Corridor - 3 projects--- Turn lane and channelization improvements along corridor –	100%							0.7	0.7	0.7	Sammamish River	✓
	Woodinville	R.PA-26	SR202 Corridor Package (SR202/148th Ave & SR202/127th Place)--- Intersection improvements (ETP R-54)	100%							0.7	0.7	0.7	Sammamish River	✓
	WSDOT	R.PA-28 & R.AC-17	SR 202 / 140 Place NE (NE 124 St to NE 175 St)--- Widen 4/5 lanes (ETP R-43) (See R.AC-17, 18)	100%			16.5	16.5			17.5	17.5	33.9	Sammamish River	✓
				50%			10.8	5.4			4.1	2.1	7.5	Soos	✓
	K C	T.PR-10	140th Ave SE and SE 192nd	100%							5.0	5.0	5.0	Soos	✓
	Bellevue	R.BI.8	I-90 to Bellevue SB HOV direct connection to I-90 west	100%				0.0	0.6	12	1	1.0	1.0	South Kelsey	✓
	Bellevue	R.BI.9	NB auxiliary lane I-90 to NE 8th	100%	2.7			0.0	1.5	16	3.2	3.2	3.2	South Kelsey	✓
	Bellevue	R.BI.10	Increase SR 405 to Eastbound SR 520 Ramp capacity	100%				0.0	3.0	20	8	8.0	8.0	South Kelsey	✓
														South Kelsey	✓
	Bellevue	R.TC-12	One additional GP lanes in each direction - SR 90 To SR 520	100%	3.8	132	73	73.0	7.6	12	12.2	12.2	85.2	South Kelsey	✓
	Bellevue	R.HOV-27	SR 90 I/C Fwy to Fwy HOV ramps,	100%					5.2	28	19.4	19.4	19.4	South Kelsey	✓
	Bellevue	R.HOV-28	SR 520 Fwy to Fwy HOV ramps,	100%					6.7	28	25.0	25.0	25.0	South Kelsey	✓
	Bellevue	R.HOV-37	NE 8th Street from I-405 to 120th Ave NE	100%	0.2	92	2.7	2.7	0.2	18	0.5	0.5	3.2	South Kelsey	✓
	Bellevue	R.HOV-60	Bellevue Way - I-90 to South Bellevue Park and Ride Vicinity	100%	0.1	70	1	1.0	0.1	22	0.3	0.3	1.3	South Kelsey	✓
				17%							8.3	1.4	1.4	South Kelsey	✓
	Bell & Issa	T.HCT-4	HCT - Factoria To Issaquah	33%							10.1	3.3	3.3	South Kelsey	✓
	Bellevue	T.HCT-5	HCT Factoria to Downtown Bellevue	100%							13.3	13.3	13.3	South Kelsey	✓
	Bellevue	NM. CR-1	Lk Washington Blvd/112th Ave. SE - crossing I-405 from 106th Ave. SE to 112th Place SE - Add sidewalks	100%	0.1	30	0.4	0.4	0.1	12	0.0	0.0	0.4	South Kelsey	✓
				30%	7.9						12.6	3.8	3.8	South Kelsey	✓
	Renton	R.BI.1	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167	100%	1.2			0.0	1.5	14	2.8	2.8	2.8	Spring Brook	✓
	Renton	R.BI.14	NB Auxilliary Lane I-5 to SR 167	100%	3.2			0.0	3.2	12	5.1	5.1	5.1	Spring Brook	✓
	Renton, Kent	R.CF.8	SR 167 I-405 to Study Area Boundary	100%	6.4	112	104.3	104.3	12.8	12	20.5	20.5	124.8	Spring Brook	✓
	Renton	R.FR-10	SR 167/I-405 Interchange Add Directional Ramps for major movements	100%					2.6	28	9.7	9.7	9.7	Spring Brook	✓
				50%			71	35.5			5.3	2.7	38.2	Spring Brook	✓
	Tukwila,Renton	R.TC-9	One additional GP lanes in each direction - SR 5 Tukwila to SR 167	80%	3.2	108	50.3	40.2	6.4	12	10.2	8.2	48.4	Spring Brook	✓
				45%			34.6	15.6			7	3.2	18.7	Spring Brook	✓
	Tukwila	R.IC-3 & R.AC-36	SR 181 West Valley Highway/ Interurban See R.AC-36	100%										Spring Brook	✓
	Renton	R.HOV-26	SR 167 I/C Fwy to Fwy HOV ramps,	100%							12.9	12.9	12.9	Spring Brook	✓
	Renton	R.HOV-44	SW 27th St Corridor in Renton from Oaksdale Ave to SR 167	100%			4.3	4.3			6.7	6.7	11.0	Spring Brook	✓
	Renton, King Co	R.HOV-48	SW 43 St from SR 167 to 140 Ave SE	50%			10.8	5.4			4.1	2.1	7.5	Spring Brook	✓
				80%							20.9	16.7	16.7	Spring Brook	✓
		T.HCT-10	HCT- Rail Maintenance and Storage Facility	100%							28.4	28.4	28.4	Spring Brook	✓
	K C	T.PR-11	SR 515 and SE 208th	100%							5.0	5.0	5.0	Spring Brook	✓
	Kent & Renton	T.PR-12	SR 167 and SW 43rd	100%							5.0	5.0	5.0	Spring Brook	✓
	Kent & Renton	T.PR-13	SR 167 and 84th Ave	100%							5.0	5.0	5.0	Spring Brook	✓
	Renton	NM. CR-6	Jackson SW/Longacres Dr SW - crossing I-405 from S. Longacres Way to Monster Rd SW - Add sidewalk/paved	100%				0.0	0.5	13.5	0.0	0.0	0.0	Spring Brook	✓
	Renton	NM.P&B-16	Cedar-Duwamish Trail Connection - I-405 to Interurban Ave. S. - Add ped/bike facilities	100%					0.5	10	0.0	0.0	0.0	Spring Brook	✓
	Renton	NM.P&B-17	I-405/SR-167 trail connection - Lind Ave. SE to Talbot Rd S. - Add trail connection	100%					0.8	10	0.0	0.0	0.0	Spring Brook	✓
	Tukwila	NM.P&B-19	SR-181/W. Valley Hwy - crossing I-405 from Strander Blvd to Fort Dent Way - Add bike lanes	100%					1.5	10	0.0	0.0	0.0	Spring Brook	✓
	KCDOT	R.PA-5	SE 212 Way/SE 208 St (SR 167 to Benson Rd/SR 515)--- Widen to 6 lanes + bike facilities, Transit/HOV preferential	100%			9.4	9.4			4.4	4.4	13.8	Spring Brook	✓
				100%							0.3	0.3	0.3	Spring Brook	✓
	Renton	R.PA-22	SW Grady Way (SR 167 to SR 515)--- Rechannelize and modify signals for a continuous eastbound lane (ETP R-	100%							0.0	0.0	0.0	Spring Brook	✓
	Renton	R.PA-23	SR 167 at East Valley Road--- New southbound off-ramp and signalization at East Valley Road (ETP 255)	100%							0.6	0.6	0.6	Spring Brook	✓
	Renton/ KCDOT	R.PA-24	Soos Creek Regional Links--- Placeholder for Trans-Valley Study (ETP R-115)	100%							0.0	0.0	0.0	Spring Brook	✓
	Sno Co, Lynnwood	R.CF.6	SR 525 I-405 to SR 99	100%	3	76	33.2	33.2	6.0	12	9.6	9.6	42.8	Swamp	✓
	Lynnwood	R.CF.10	I-5 at Swamp Creek - 44th to 164th	100%	4	136	79.1	79.1	4.0	12	6.4	6.4	85.5	Swamp	✓
				20%			58.6	11.7			11.5	2.3	14.0	Swamp	✓
	Sno. Co.	R.HOV-30	SR 5 I/C @ Swamp Creek Fwy HOV ramps.	100%							12.9	12.9	12.9	Swamp	✓
	Various	T.HCT-9	HCT - Bothell to Lynnwood	11%							12.4	1.4	1.4	Swamp	✓
	King County	NM. CR-3	SR-524 (Filbert Road) - crossing I-405 from North Rd to Locust Way - Add sidewalk/paved shoulder	100%			0.0	0.0			1.9	1.9	1.9	Swamp	✓
	Renton	NM.P&B-15	Cedar River Trail/Lake Washington Blvd Connector - Cedar River Trail to Lk Wash Blvd Loop - Add ped/bike	50%					0.9	10	1.1	0.6	0.6	WLW	✓
	TOTAL											**646.4**	**1712.3**		**154**

Alternative 3
Impervious Area by Basin

I-405 Corridor Program

EIS Alternatives Impervious Surface

	Jurisdiction	*ACTIONS*		*Percentage per Sub Basin*	*Length in C/L Miles*	*Existing Paved Width*	*Existing Impervious Total Basin Area - Acres*	*Existing Impervious Sub Basin Area - Acres*	*New Lanes Miles*	*New Paved Width*	*New Impervious Total Basin Area - Acres*	*New Impervious Sub Basin Area - Acres*	*Total Imperv. Area Acres*	*Stream Basin*	*Alternative*
Element #															**3**
															Mixed Mode
	Redmond	R.HOV-47	Avondale Rd from Novelty Hill Rd to Avondale Way/ Construct SB HOV lane	100%			8.6	8.6			1.5	1.5	10.1	Bear	✓
	KCDOT	R.PA-8	NE 124/128 St (SR 202 to Avondale Rd)--- Widen to 4/5 lanes including bike & equestrian facilities (ETP 164)	50%			9.9	5.0			3.2	1.6	6.6	Bear	✓
	Redmond	R.PA-17	Bear Creek Pkwy--- Construct new 162nd Ave NE arterial and new 72nd St arterial w/ bike/ped and CSG; widen	100%			3.2	3.2			4.2	4.2	7.4	Bear	✓
	Redmond	R.PA-18	Union Hill Rd (Avondale Rd to 196 Ave NE)--- Widen to 4/5 lanes with bike facilities (ETP R-27)	50%			5.8	2.9			6.1	3.1	6.0	Bear	✓
	WSDOT	R.PA-27	SR 520/SR 202 Interchange --- Complete interchange by constructing a new ramp and thru lane on 202 to SR 520	100%			16.5	16.5			7.8	7.8	24.3	Bear	✓
	Renton	R.TC-2	Two additional GP lanes in each direction - SR 167 to SR 900/North Renton I/C	55%	2.2	108	34.6	19.0	8.8	12	14.1	7.8	26.7	Cedar	✓
	King Co, Renton	R.AC-3	138th Ave SE - Construct roadway link to 4/5 lanes- SR 169 to NE 4th St	100%			7.7	7.7			11.1	11.1	18.8	Cedar	✓
	Renton	R.IC-4 & R.HOV-43	SR 169 Maple Valley Hwy SR 900 to NE 5th See R.HOV-43	100%										Cedar	✓
	Renton	R.HOV-43 & R.IC-4	SR 169 from SR 405 to Riverview Park Vicinity - HOV/Transit Preferential treatment.	100%			8	8.0			1.4	1.4	9.4	Cedar	✓
	Renton	R.HOV-49	Logan Ave N/N 6 St from S 3 St to Park Dr, Transit Signal Priority	100%			0	0.0			0.0	0.0	0.0	Cedar	✓
	K C	T.PR-8	SR 169 and 140th Place SE	100%							5.0	5.0	5.0	Cedar	✓
	K C	T.PR-9	Petrovitsky Rd and 157th Ave SE	100%							5.0	5.0	5.0	Cedar	✓
	Renton	NM.P&B-14	Cedar River Trail S. Extension - I-405 to Burnett Ave - Add ped/bike facilities	100%					0.1	10	0.0	0.0	0.0	Cedar	✓
	Renton	R.PA-19	Duvall Ave NE (NE 4 St to NE 25 Court -City Limits)--- Widen to 5 lanes + CGS, bikeway (ETP R-31)	100%			8.5	8.5			4.2	4.2	12.7	Cedar	✓
	Bellevue	R.BI.4	I-90 / Coal Creek Interchange	100%				0.0	1.6	50	10.7	10.7	10.7	Coal	✓
	Bellevue	R.HOV-36	Coal Creek Pkwy from I-405 to Forest Drive	100%	0.1		0	0.0	0.1	12	0.2	0.2	0.2	Coal	✓
	Newcastle	R.PA-15	Coal Creek Pkwy (SE 72 St to Renton City Limits)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signals (ETP R-	25%	1.6	32	7.4	1.9	3.2	12	5.1	1.3	3.1	Coal	✓
	Renton	R.PA-20	Oakesdale Ave SW (Monster Rd to SR 900) Replace Monster Rd Bridge; widen to 4/5 lanes +Bike Lanes + CGS	50%			2.9	1.5			3.2	1.6	3.1	Duwamish River	✓
	Renton	R.PA-21	Rainier Ave / Grady Way (intersection)-- Grade separation	100%							0.2	0.2	0.2	Duwamish River	✓
	Renton, Nwcas,Bel	R.TC-3	Two additional GP lanes in each direction - SR 900/North Renton I/C to SR 90	37%	5.6	108	88	32.6	22.4	12	35.8	13.2	45.8	East Lake Washington	✓
				43%			88	37.8			35.8	15.4	53.2	East Lake Washington	✓
	Bellevue,Kirkland	R.TC-5	Two additional GP lanes in each direction - SR 520 to NE 70th	100%	2.9	144	60.7	60.7	11.6	12	18.6	18.6	79.3	East Lake Washington	✓
	Kirkland	R.HOV-61	NE 85th	100%							3.5	3.5	3.5	East Lake Washington	✓
				60%			2	1.2			0.5	0.3	1.5	East Lake Washington	✓
	Kirkland, Bellevue	R.HOV-56	Lake Washington Blvd (SR 520 to Yarrow Bay) - HOV lanes	100%			6.4	6.4			1.3	1.3	7.7	East Lake Washington	✓
	Kirkland	R.HOV-57	NE 68 St/NE 72 Pl (I-405 Vicinity) Que Bypass'	100%			1	1.0			0.2	0.2	1.2	East Lake Washington	✓
	Renton	NM. CR-5	NE Park Drive - crossing I-405 from SR-900/Sunset Blvd to Lake Wash Blvd - Add sidewalk/paved shoulder	100%				0.0	0.8	13.5	0.0	0.0	0.0	East Lake Washington	✓
				60%	7.9						12.6	7.6	7.6	East Lake Washington	✓
	Bellevue	NM.P&B-4	Lk Washington Blvd - SR 405 to SE 60th - Add ped/bike facilities	100%	0.5	20	1.5	1.5	0.5	16	0.1	0.1	1.6	East Lake Washington	✓
	Bel,Nwcas,Ren	NM.P&B-6	Lk Washington Blvd/112th - SE 60th to May Creek I/C - Add ped/bike facility	100%	0.5	20	1.5	1.5	0.5	15	0.1	0.1	1.6	East Lake Washington	✓
				50%			5.8	2.9			6.1	3.1	6.0	Evans	✓
				60%			49.9	29.9			16.6	10.0	40.0	Forbes	✓
				45%			5.2	2.3			1.8	0.8	3.2	Forbes	✓
				50%			5.5	2.8			1.9	1.0	3.7	Forbes	✓
				50%			12.8	6.4			2.3	1.2	7.6	Forbes	✓
	Bellevue,Kirkland	NM.P&B-2	BNSF Right of Way - SE 8th to Totem Lake - Add ped/bike facility.	10%	7.9		0.0	0.0	7.9	12	12.6	1.3	1.3	Forbes	✓
	Kirkland	R.PA-12	124 Ave NE (NE 85 St to Slater Rd NE)--- Widen to 3 lanes (s. of NE 116th St, 5 lanes n. of NE 116th St with	100%			4.7	4.7			1.1	1.1	5.8	Forbes	✓
	Kirkland	R.PA-14	NE 100 St (117 Ave NE to Slater Ave) --- Construct bike/pedestrian/emergency Vehicle overpass across I-405 (ETP	100%			0.0	0.0			0.3	0.3	0.3	Forbes	✓
	Kirkland	R.TC-6	Two additional GP lanes in each direction - NE 70th to NE 124th	40%	2.6	132	49.9	20.0	10.4	12	16.6	6.6	26.6	Juanita	✓
				60%			65.3	39.2			21.8	13.1	52.2	Juanita	✓
	Kirkland	R.IC-9	NE 116th- 114th Ave NE to 124th Ave NE	50%			5.5	2.8			1.9	1.0	3.7	Juanita	✓
	Kirkland	R.IC-10	NE 124th- 113th Ave NE to 124th Ave NE	100%			5.4	5.4			1.8	1.8	7.2	Juanita	✓
	Kirk,King Co	R.IC-14	New half diamond interchange to/from north at NE 132nd St	100%				0.0			1.8	1.8	1.8	Juanita	✓
	Kirkland	R.IC-26 & R.PA-13	NE 132nd - 113th to 124th Ave NE	100%			4.3	4.3			2.3	2.3	6.6	Juanita	✓
	Kirkland	R.HOV-39	NE 116th from 115th Ave NE to 124th Ave NE	100%			5.2	5.2			1.0	1.0	6.2	Juanita	✓
	Kirkland	R.HOV-40	NE 124th from 113th Ave NE to 132 Ave NE	100%			3.9	3.9			0.7	0.7	4.6	Juanita	✓
	Kirkland	R.PA-13 & R.IC-26	NE 132 St (100 Ave NE to 116 Way NE)--- Widen to 3 lanes + CGS, Bike lane (ETP R-124) See R.IC-26	100%				0.0			0.0	0.0	0.0	Juanita	✓
				45%			32	14.4			8	3.6	18.0	Little Bear	✓
	Both,Woodin	R.AC-30 & R.PA.25	SR 202 connection across SR 522 to 120th	100%										Little Bear	✓
				20%			50.3	10.1			20.5	4.1	14.1	Lower Green River	✓
	Tuikwila	R.CF.1	SR 518 I-405 to SR 99/Airport Access	100%	1.9	78	21.6	21.6	3.8	12	6.1	6.1	27.7	Lower Green River	✓
	Tukwila	R.CF.9	I-5 at Tukwila	50%	3.3	148	71	35.5	3.3	12	5.3	2.7	38.2	Lower Green River	✓
	Tukwila	R.HOV-25	SR 5 I/C @ Tukwila Fwy to Fwy HOV ramps,	100%							19.4	19.4	19.4	Lower Green River	✓
	Renton/Tukwila	NM.P&B-18	I-405/1-5 - via or around I-405/I-5 interchange - Add ped/bike facilities	100%					0.5	10	0.0	0.0	0.0	Lower Green River	✓
	Renton	R.HOV-51	Park Dr/Sunset Blvd from Garden Ave to Duvall Ave NE, Que Bypass'	40%			2	0.8			0.5	0.2	1.0	May	✓
				75%			7.4	5.6			5.1	3.8	9.4	May	✓
	Bothell,Sno Co	R.TC-8	Two additional GP lanes in each direction - SR 522 to SR 527	100%	3	112	48.9	48.9	12	12	19.2	19.2	68.1	North	✓
	Sno Co	R.TC-9	Two additional GP lanes in each direction - SR 527 to SR 5 Swamp Creek	80%	3.6	112	58.6	46.9	14.4	12	23	18.4	65.4	North	✓
	Bothell	R.IC-11	SR 527-228th to SR 524	100%			12.7	12.7			2.4	2.4	15.1	North	✓
	Bothell	R.IC-21	New SR 405 interchange at 240th Street SE(Bothell)	100%				0.0			4.4	4.4	4.4	North	✓
	Bothell	R.HOV-29	SR 522 Fwy to Fwy HOV Ramps	100%							12.9	12.9	12.9	North	✓
	Bothell	R.HOV-41	SR 527 From SE 228th St to SR 524	100%			12.7	12.7			3.8	3.8	16.5	North	✓
	Bothell	NM. CR-2	Fitzgerald Rd/27th Ave. - crossing I-405 from 228th St. SE to 240th St. SE - Add ped/bike facility	100%			0.0	0.0			1.9	1.9	1.9	North	✓
	Sno. County	NM. CR-4	Damson Road - crossing I-405 from 192nd St SW to Logan Rd - Add sidewalk/paved shoulder	100%			0.0	0.0			2.8	2.8	2.8	North	✓
	Bothell	NM. CR-7	Connection between Sammamish River Trail and North Creek Trail - between SR-522 and NE 195th St. - Add	100%			0.0	0.0			1.2	1.2	1.2	North	✓
	Bothell	NM. CR-8	SR-527 - crossing I-405 from 220th St SE to 228th St SE - ped/bike facility	100%			0.0	0.0			1.4	1.4	1.4	North	✓
	Bothell	NM.P&B-5	North Creek Trail Link - 240th to 232nd - Add ped/bike trail.	100%			0.0	0.0			0.6	0.6	0.6	North	✓
	Bothell	R.PA-4	SR 524 (SR 527 to Bothell City Limit)--- Widen to 5 lanes + CGS, bike facilities (class III) (ETP R-11)	100%			5.1	5.1			8.9	8.9	14.0	North	✓
	Kenmore	R.HOV-53 & R.PA.11	68 Ave NE (Simonds Rd to SR 522) - Construct NB HOV lane	45%			4.5	2.0			0.5	0.2	2.3	North Lake Washington	✓
	Bothell	R.PA-3	SR 522 Multimodal Corridor Project--- Widen SR-522 mostly within existing ROW to provide transit lanes, safety	20%			0.0	0.0			1.1	0.2	0.2	North Lake Washington	✓
	Kirk,K C,Both	R.TC-7	Two additional GP lanes in each direction - NE 124th SR 522	40%	3.4	132	65.3	26.1	13.6	12	21.8	8.7	34.8	Sammamish River	✓
	Bothell, Woodin	R.CF.5	SR 522 Bothell to NE 195th	55%	2.5	88	32	17.6	5.0	12	8	4.4	22.0	Sammamish River	✓
	King Co,Woodin	R.AC-16	Willows Rd- NE 124th St to NE 145th St- construct new facility -4/5 lanes	100%			0.9	0.9			14.4	14.4	15.3	Sammamish River	✓
	Woodinville	R.AC-17 & R.PA-28	SR 202- NE 145th St to SR 522- widen to 5 lanes	100%			10.2	10.2			10.0	10.0	20.2	Sammamish River	✓
	Kirkland, Redmond	R.IC-8	NE 85th St-Kirkland Way to 124th	55%			5.2	2.9			1.8	1.0	3.9	Sammamish River	✓
	Bothell	R.IC-24 & R-40	NE 160th Street-112th Ave to Juanita/Woodinville Wy See R-40	100%				0.0			0.0	0.0	0.0	Sammamish River	✓
	Kirk, Redmond	R.HOV-38	NE 85th St from Kirkland Way to 148th Ave NE Vicinity	50%			12.8	6.4			2.3	1.2	7.6	Sammamish River	✓
				55%			4.5	2.5			0.5	0.3	2.8	Sammamish River	✓
	Redmond	R.HOV-55	Willows Rd (Redmond Wy to NE 124 St)	100%			3.3	3.3			0.7	0.7	4.0	Sammamish River	✓
	Redmond	T.PR-17	Willows Rd @ NE 100th	100%							5.0	5.0	5.0	Sammamish River	✓
	Redmond	T.PR-18	SR 202 @ NE 100th	100%							5.0	5.0	5.0	Sammamish River	✓
	KC	T.PR-26	SR 202 @ NE 145th					0.0				0.0		Sammamish River	✓
	Bellevue	R.PA-2	148 Ave SE (SE 24 St to SE 28 St) New SB lane from SE 24 St to the WB I-90 on-ramp (ETP 203)	100%	0.5	72	5.2	5.2	0.5	12	0.7	0.7	5.9	Sammamish River	✓
				80%			0.0	0.0			1.1	0.9	0.9	Sammamish River	✓
				50%			9.9	5.0			4.7	2.4	7.3	Sammamish River	✓
	KCDOT	R.PA-10	NE 132 St Extension (132 Ave NE to Willows Rd Ext.)---- Construct new 3 lane arterial with CGS, bike lanes (ETP	100%			0.0	0.0			2.1	2.1	2.1	Sammamish River	✓
	Kenmore/KCDOT	R.PA-11 & R.HOV.53	68 Ave NE (Simonds Rd to SR 522)--- Construct NB HOV lane total of 5/6 lanes (ETP 22) See R.HOV-53	100%				0.0			0.0	0.0	0.0	Sammamish River	✓
	Redmond	R.PA-16	Redmond 148th Ave NE Corridor - 3 projects--- Turn lane and channelization improvements along corridor –	100%							0.7	0.7	0.7	Sammamish River	✓
	Woodinville	R.PA-26	SR202 Corridor Package (SR202/148th Ave & SR202/127th Place)--- Intersection improvements (ETP R-54)	100%							0.7	0.7	0.7	Sammamish River	✓
	WSDOT	R.PA-28 & R.AC-17	SR 202 / 140 Place NE (NE 124 St to NE 175 St)--- Widen 4/5 lanes (ETP R-43) (See R.AC-17, 18)	100%			16.5	16.5			17.5	17.5	33.9	Sammamish River	✓
				50%			10.8	5.4			4.1	2.1	7.5	Soos	✓
	K C	T.PR-10	140th Ave SE and SE 192nd	100%							5.0	5.0	5.0	Soos	✓
													24.8	South Kelsey	✓
	Bellevue	R.TC-4	Two additional GP lanes in each direction - SR 90 To SR 520	100%	3.8	132	73	73.0	15.2	12	24.3	24.3	97.3	South Kelsey	✓
	Bellevue	R.CF.3	I-90 South Bellevue to Eastgate	100%	3.5	148	75.3	75.3	7.0	12	11.2	11.2	86.5	South Kelsey	✓

Alternative 3
Impervious Area by Basin

	Bellevue		R.HOV-27	SR 90 I/C Fwy to Fwy HOV ramps,	100%					5.2	28	19.4	19.4	19.4	South Kelsey	✓
	Bellevue		R.HOV-28	SR 520 Fwy to Fwy HOV ramps,	100%					6.7	28	25.0	25.0	25.0	South Kelsey	✓
	Bellevue		R.HOV-37	NE 8th Street from I-405 to 120th Ave NE	100%	0.2	92	2.7	2.7	0.2	18	0.5	0.5	3.2	South Kelsey	✓
	Bellevue		R.HOV-60	Bellevue Way - I-90 to South Bellevue Park and Ride Vicinity	100%	0.1	70	1	1.0	0.1	22	0.3	0.3	1.3	South Kelsey	✓
	Bellevue		NM. CR-1	Lk Washington Blvd/112th Ave. SE - crossing I-405 from 106th Ave. SE to 112th Place SE - Add sidewalks	100%	0.1	30	0.4	0.4	0.1	12	0.0	0.0	0.4	South Kelsey	✓
					30%	7.9						12.6	3.8	3.8	South Kelsey	✓
	Renton		R.BI.1	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167	100%	1.2			0.0	1.5	14	2.8	2.8	2.8	Spring Brook	✓
	Tukwila,Renton		R.TC-1	Two additional GP lanes in each direction - SR 5 Tukwila to SR 167	80%	3.2	108	50.3	40.2	12.8	12	20.5	16.4	56.6	Spring Brook	✓
					45%			34.6	15.6			14.1	6.3	21.9	Spring Brook	✓
	Renton, Kent		R.CF.8	SR 167 I-405 to Study Area Boundary	100%	6.4	112	104.3	104.3	12.8	12	20.5	20.5	124.8	Spring Brook	✓
	Renton		R.FR-10	SR 167/I-405 Interchange Add Directional Ramps for major movements	100%					2.6	28	9.7	9.7	9.7	Spring Brook	✓
					50%			71	35.5			5.3	2.7	38.2	Spring Brook	✓
	Tukwila		R.IC-3 & R.AC-36	SR 181 West Valley Highway/ Interurban See R.AC-36	100%										Spring Brook	✓
	ST		HOV-101	I-405 @ Lind/HOV direct access improvements.	100%							4.5	4.5	4.5	Spring Brook	✓
	Renton		R.HOV-26	SR 167 I/C Fwy to Fwy HOV ramps,	100%							12.9	12.9	12.9	Spring Brook	✓
	Renton		R.HOV-44	SW 27th St Corridor in Renton from Oaksdale Ave to SR 167	100%			4.3	4.3			6.7	6.7	11.0	Spring Brook	✓
	Renton, King Co		R.HOV-48	SW 43 St from SR 167 to 140 Ave SE	50%			10.8	5.4			4.1	2.1	7.5	Spring Brook	✓
	K C		T.PR-11	SR 515 and SE 208th	100%							5.0	5.0	5.0	Spring Brook	✓
	Kent & Renton		T.PR-12	SR 167 and SW 43rd	100%							5.0	5.0	5.0	Spring Brook	✓
	Kent & Renton		T.PR-13	SR 167 and 84th Ave	100%							5.0	5.0	5.0	Spring Brook	✓
	Renton		NM. CR-6	Jackson SW/Longacres Dr SW - crossing I-405 from S. Longacres Way to Monster Rd SW - Add sidewalk/paved	100%				0.0	0.5	13.5	0.0	0.0	0.0	Spring Brook	✓
	Renton		NM.P&B-16	Cedar-Duwamish Trail Connection - I-405 to Interurban Ave. S. - Add ped/bike facilities	100%					0.5	10	0.0	0.0	0.0	Spring Brook	✓
	Renton		NM.P&B-17	I-405/SR-167 trail connection - Lind Ave. SE to Talbot Rd S. - Add trail connection	100%					0.8	10	0.0	0.0	0.0	Spring Brook	✓
	Tukwila		NM.P&B-19	SR-181/W. Valley Hwy - crossing I-405 from Strander Blvd to Fort Dent Way - Add bike lanes	100%					1.5	10	0.0	0.0	0.0	Spring Brook	✓
	KCDOT		R.PA-5	SE 212 Way/SE 208 St (SR 167 to Benson Rd/SR 515)--- Widen to 6 lanes + bike facilities, Transit/HOV preferential	100%			9.4	9.4			4.4	4.4	13.8	Spring Brook	✓
					100%							0.3	0.3	0.3	Spring Brook	✓
	Renton		R.PA-22	SW Grady Way (SR 167 to SR 515)--- Rechannelize and modify signals for a continuous eastbound lane (ETP R-	100%							0.0	0.0	0.0	Spring Brook	✓
	Renton		R.PA-23	SR 167 at East Valley Road--- New southbound off-ramp and signalization at East Valley Road (ETP 255)	100%							0.6	0.6	0.6	Spring Brook	✓
	Renton/ KCDOT		R.PA-24	Soos Creek Regional Links--- Placeholder for Trans-Valley Study (ETP R-115)	100%							0.0	0.0	0.0	Spring Brook	✓
					20%			58.6	11.7			23	4.6	16.3	Swamp	✓
	Sno Co, Lynnwood		R.CF.6	SR 525 I-405 to SR 99	100%	3	76	33.2	33.2	6.0	12	9.6	9.6	42.8	Swamp	✓
	Lynnwood		R.CF.10	I-5 at Swamp Creek - 44th to 164th	100%	4	136	79.1	79.1	4.0	12	6.4	6.4	85.5	Swamp	✓
	Sno. Co.		R.HOV-30	SR 5 I/C @ Swamp Creek Fwy HOV ramps.	100%							12.9	12.9	12.9	Swamp	✓
	King County		NM. CR-3	SR-524 (Filbert Road) - crossing I-405 from North Rd to Locust Way - Add sidewalk/paved shoulder	100%			0.0	0.0			1.9	1.9	1.9	Swamp	✓
	Renton		NM.P&B-15	Cedar River Trail/Lake Washington Blvd Connector - Cedar River Trail to Lk Wash Blvd Loop - Add ped/bike	50%					0.9	10	1.1	0.6	0.6	WLW	✓
	TOTAL												**599.8**	**1788.8**		**130**

Alternative 4
Impervious Area by Basin

I-405 Corridor Program

EIS Alternatives Impervious Surface

	Jurisdiction	*ACTIONS*		*Percentage per Sub Basin*	*Length in C/L Miles*	*Existing Paved Width*	*Existing Impervious Total Basin Area - Acres*	*Existing Impervious Sub Basin Area - Acres*	*New Lanes Miles*	*New Paved Width*	*New Impervious Total Basin Area - Acres*	*New Impervious Sub Basin Area - Acres*	*Total Imperv. Area Acres*	*Stream Basin*	*Alternative 4*
Element #															**General Capacity**
	KCDOT	R.PA-8	NE 124/128 St (SR 202 to Avondale Rd)--- Widen to 4/5 lanes including bike & equestrian facilities (ETP 164)	50%			9.9	5.0			3.2	1.6	6.6	Bear	✓
	Redmond	R.PA-17	Bear Creek Pkwy--- Construct new 162nd Ave NE arterial and new 72nd St arterial w/ bike/ped and CSG; widen	100%			3.2	3.2			4.2	4.2	7.4	Bear	✓
	Redmond	R.PA-18	Union Hill Rd (Avondale Rd to 196 Ave NE)--- Widen to 4/5 lanes with bike facilities (ETP R-27)	50%			5.8	2.9			6.1	3.1	6.0	Bear	✓
	WSDOT	R.PA-27	SR 520/SR 202 Interchange --- Complete interchange by constructing a new ramp and thru lane on 202 to SR 520	100%			16.5	16.5			7.8	7.8	24.3	Bear	✓
	Renton	R.TC-21	Add Express lanes - SR 167 to SR 900 North Renton	55%	2.2	10B	34.6	19.0	8.8	21	24.6	13.5	32.6	Cedar	✓
	Renton	R.TC-10	One additional GP lanes in each direction - SR 167 to SR 900/North Renton I/C	55%	2.2	10B	34.6	19.0	4.4	12	7	3.9	22.9	Cedar	✓
	King Co, Renton	R.AC-3	138th Ave SE - Construct roadway link to 4/5 lanes- SR 169 to NE 4th St	100%			7.7	7.7			11.1	11.1	18.8	Cedar	✓
	Renton	R.IC-4 & R.HOV-43	SR 169 Maple Valley Hwy SR 900 to NE 5th See R.HOV-43	100%										Cedar	✓
	Renton	R.PA-19	Duvall Ave NE (NE 4 St to NE 25 Court -City Limits)--- Widen to 5 lanes + CGS, bikeway (ETP R-31)	100%			8.5	8.5			4.2	4.2	12.7	Cedar	✓
	Bellevue	R.BI.4	I-90 / Coal Creek Interchange	100%				0.0	1.6	50	10.7	10.7	10.7	Coal	✓
	Newcastle	R.PA-15	Coal Creek Pkwy (SE 72 St to Renton City Limits)--- Widen to 4/5 lanes + CGS, bike lanes, traffic signals (ETP R-	25%	1.6	32	7.4	1.9	3.2	12	5.1	1.3	3.1	Coal	✓
	Tukwila	R.AC-36& R.IC-3	SR 181- 144th to Strander Blvd.	40%			4.9	2.0			1.7	0.7	2.6	Duwamish River	✓
	Renton	R.PA-20	Oakesdale Ave SW (Monster Rd to SR 900) Replace Monster Rd Bridge; widen to 4/5 lanes +Bike Lanes + CGS	50%			2.9	1.5			3.2	1.6	3.1	Duwamish River	✓
	Renton	R.PA-21	Rainier Ave / Grady Way (intersection)-- Grade separation	100%							0.2	0.2	0.2	Duwamish River	✓
				50%							3.4	1.7	1.7	East Lake Washington	✓
	Ren, Nwcas,Bel	R.TC-22	Add Express lanes -SR 900 North Renton I/C to SR 90	80%	5.6	10B	88	70.4	22.4	21	62.7	50.2	120.6	East Lake Washington	✓
	Bellevue,Kirkland	R.TC-24	Add Express lanes - SR 520 to NE 70th	100%	2.9	144	60.7	60.7	11.6	21	32.5	32.5	93.2	East Lake Washington	✓
	Kirkland	R.TC-32	Slip Ramp- South of NE 70th St	100%	1.8				7.2	12	11.5	11.5	11.5	East Lake Washington	✓
	Bellevue	R.CF.4	SR 520 Bellevue Way to 148th	55%	4.1	10B	64.4	35.4	8.2	12	13.1	7.2	42.6	East Lake Washington	✓
	Ren, Nwcas,Bel	R.TC-11	One additional GP lanes in each direction - SR 900/North Renton I/C to SR 90	37%	5.6	10B	88	32.6	11.2	12	17.9	6.6	39.2	East Lake Washington	✓
				43%			88	37.8			17.9	7.7	45.5	East Lake Washington	✓
	Bellevue,Kirkland	R.TC-13	One additional GP lanes in each direction - SR 520 to NE 70th (Varify need for additional through capacity on this	100%	2.9	144	60.7	60.7	5.8	12	9.3	9.3	70.0	East Lake Washington	✓
	Renton	NM. CR-5	NE Park Drive - crossing I-405 from SR-900/Sunset Blvd to Lake Wash Blvd - Add sidewalk/paved shoulder	100%				0.0	0.8	13.5	0.0	0.0	0.0	East Lake Washington	✓
				50%			5.8	2.9			6.1	3.1	6.0	Evans	✓
	Kirkland	R.BI.2	Continue NB climbing Lane from NE 70th to NE 85th and continue as auxiliary Lane to NE 116th	100%	2.5			0.0	2.5	12	4	4.0	4.0	Forbes	✓
	Kirkland	R.BI.3	SB auxiliary Lane NE 124th to NE 85th	100%	1.3			0.0	1.3	12	2.1	2.1	2.1	Forbes	✓
				60%			49.9	29.9			29.1	17.5	47.4	Forbes	✓
				60%			49.9	29.9			8.3	5.0	34.9	Forbes	✓
				45%			5.2	2.3			1.8	0.8	3.2	Forbes	✓
				50%			5.5	2.8			1.9	1.0	3.7	Forbes	✓
	Kirkland	R.PA-12	124 Ave NE (NE 85 St to Slater Rd NE)--- Widen to 3 lanes (s. of NE 116th St, 5 lanes n. of NE 116th St with	100%			4.7	4.7			1.1	1.1	5.8	Forbes	✓
	Kirkland	R.PA-14	NE 100 St (117 Ave NE to Slater Ave) --- Construct bike/pedestrian/emergency Vehicle overpass across I-405 (ETP	100%			0.0	0.0			0.3	0.3	0.3	Forbes	✓
				69%							4	2.8	2.8	Juanita	✓
	Kirkland	R.TC-25	Add Express lanes - NE 70th to NE 124th	40%	2.6	132	49.9	20.0	10.4	21	29.1	11.6	31.6	Juanita	✓
				60%			65.3	39.2			38.1	22.9	62.0	Juanita	✓
	King Co,Kirkland	R.TC-31	Slip Ramp- South of NE 160th St	100%	1.8				7.2	12	11.5	11.5	11.5	Juanita	✓
	Kirkland	R.TC-14	One additional GP lanes in each direction - NE 70th to NE 124th	40%	2.6	132	49.9	20.0	5.2	12	8.3	3.3	23.3	Juanita	✓
				60%			65.3	39.2			10.9	6.5	45.7	Juanita	✓
	Kirkland	R.IC-9	NE 116th- 114th Ave NE to 124th Ave NE	50%			5.5	2.8			1.9	1.0	3.7	Juanita	✓
	Kirkland	R.IC-10	NE 124th- 113th Ave NE to 124th Ave NE	100%			5.4	5.4			1.8	1.8	7.2	Juanita	✓
	Kirk,King Co	R.IC-14	New half diamond interchange to/from north at NE 132nd St	100%				0.0			1.8	1.8	1.8	Juanita	✓
	Kirkland	R.IC-26 & R.PA-13	NE 132nd - 113th to 124th Ave NE	100%			4.3	4.3			2.3	2.3	6.6	Juanita	✓
	Kirkland	R.PA-13 & R.IC-26	NE 132 St (100 Ave NE to 116 Way NE)--- Widen to 3 lanes + CGS, Bike lane (ETP R-124) See R.IC-26	100%				0.0			0.0	0.0	0.0	Juanita	✓
				45%			32	14.4			8	3.6	18.0	Little Bear	✓
	Both,Woodin	R.AC-30 & R.PA.25	SR 202 connection across SR 522 to 120th	100%										Little Bear	✓
				20%			50.3	10.1			35.8	7.2	17.2	Lower Green River	✓
	Tuikwila	R.CF.1	SR 518 I-405 to SR 99/Airport Access	100%	1.9	78	21.6	21.6	3.8	12	6.1	6.1	27.7	Lower Green River	✓
	Tukwila	R.CF.9	I-5 at Tukwila	50%	3.3	148	71	35.5	3.3	12	5.3	2.7	38.2	Lower Green River	✓
				20%			50.3	10.1			10.2	2.0	12.1	Lower Green River	✓
				60%			4.9	2.9			1.7	1.0	4.0	Lower Green River	✓
	Tukwila	R.AC-37	Southcenter Pky - Tukwila Pky to Strander Blvd	100%			5.7	5.7			1.9	1.9	7.6	Lower Green River	✓
	Tukwila	R.HOV-25	SR 5 I/C @ Tukwila Fwy to Fwy HOV ramps,	100%							19.4	19.4	19.4	Lower Green River	✓
	Renton/Tukwila	NM.P&B-18	I-405/1-5 - via or around I-405/I-5 interchange - Add ped/bike facilities	100%					0.5	10	0.0	0.0	0.0	Lower Green River	✓
	Renton	R.BI.7	Kennydale Hill climbing lane - SR 900 to 44th - NB 900 to 30th, SB 44th - 30th	50%	2.1			0.0	2.1	12	3.4	1.7	1.7	May	✓
				75%			7.4	5.6			5.1	3.8	9.4	May	✓
	Bothell	R.BI.6	NB auxiliary lane Sr 522 to SR 527	100%	3			0.0	3.0	12	4.8	4.8	4.8	North	✓
	Bothell,Sno Co	R.TC-27	Add Express lanes - SR 522 to SR 527	100%	3	112	48.9	48.9	12	21	33.6	33.6	82.5	North	✓
	Sno. Co	R.TC-29	Add Express Lanes - SR 527 to SR 5 Swamp Creek	80%	3.6	112	58.6	46.9	14.4	21	40.3	32.2	79.1	North	✓
	Bothell,Sno Co	R.TC-16	One additional GP lanes in each direction - SR 522 to SR 527	100%	3	112	48.9	48.9	6.0	12	9.6	9.6	58.5	North	✓
	Sno. Co	R.TC-17	One additional GP lanes in each direction - SR 527 to SR 5 Swamp Creek	80%	3.6	112	58.6	46.9	7.2	12	11.5	9.2	56.1	North	✓
	Both,S C,Mill Cr	R.AC-20	SR 527/Bothell Everett Hwy - SR 522 to SR 524 - Widen by 1 lane each direction	50%			9.3	4.7			3.9	2.0	6.6	North	✓
	Bothell	R.IC-11	SR 527-228th to SR 524	100%			12.7	12.7			2.4	2.4	15.1	North	✓
	Bothell	R.IC-21	New SR 405 Interchange at 240th Street SE(Bothell)	100%				0.0			4.4	4.4	4.4	North	✓
	Bothell	R.HOV-29	SR 522 Fwy to Fwy HOV Ramps	100%							12.9	12.9	12.9	North	✓
	Bothell	NM. CR-2	Fitzgerald Rd/27th Ave. - crossing I-405 from 228th St. SE to 240th St. SE - Add ped/bike facility	100%			0.0	0.0			1.9	1.9	1.9	North	✓
	Sno. County	NM. CR-4	Damson Road - crossing I-405 from 192nd St SW to Logan Rd - Add sidewalk/paved shoulder	100%			0.0	0.0			2.8	2.8	2.8	North	✓
	Bothell	NM. CR-7	Connection between Sammamish River Trail and North Creek Trail - between SR-522 and NE 195th St. - Add	100%			0.0	0.0			1.2	1.2	1.2	North	✓
	Bothell	NM. CR-8	SR-527 - crossing I-405 from 220th St SE to 228th St SE - ped/bike facility	100%			0.0	0.0			1.4	1.4	1.4	North	✓
	Bothell	R.PA-4	SR 524 (SR 527 to Bothell City Limit)--- Widen to 5 lanes + CGS, bike facilities (class III) (ETP R-11)	100%			5.1	5.1			8.9	8.9	14.0	North	✓
	Bothell	R.PA-3	SR 522 Multimodal Corridor Project--- Widen SR-522 mostly within existing ROW to provide transit lanes, safety	20%			0.0	0.0			1.1	0.2	0.2	North Lake Washington	✓
	Both,King Co,Kirk	R.BI.5	SB SR 522 to 124th continue climbing lane as an auxiliary lane	35%	2.5			0.0	2.5	12	4	1.4	1.4	Sammamish River	✓
	Kirk,K C,Both	R.TC-26	Add Express lanes - NE 124th to SR 522	40%	3.4	132	65.3	26.1	13.6	21	38.1	15.2	41.4	Sammamish River	✓
	Bothell, Woodin	R.CF.5	SR 522 Bothell to NE 195th	55%	2.5	88	32	17.6	5.0	12	8	4.4	22.0	Sammamish River	✓
	Kirk,K C,Both	R.TC-15	One additional GP lanes in each direction - NE 124th SR 522	40%	3.4	132	65.3	26.1	6.8	12	10.9	4.4	30.5	Sammamish River	✓
	Redmond	R.AC-15 & R-111	Willows Rd- NE 90th St to NE 124th St- Add 1 lane each direction	100%			11.3	11.3			5.3	5.3	16.6	Sammamish River	✓
	King Co,Woodin	R.AC-16	Willows Rd- NE 124th St to NE 145th St- construct new facility -4/5 lanes	100%			0.9	0.9			14.4	14.4	15.3	Sammamish River	✓
	Woodinville	R.AC-17 & R.PA-28	SR 202- NE 145th St to SR 522- widen to 5 lanes	100%			10.2	10.2			10.0	10.0	20.2	Sammamish River	✓
	Red,K C,Woodin	R.AC-18 & R.PA 28	SR 202 - NE 90th to NE 145th	100%			15.3	15.3			10.8	10.8	26.1	Sammamish River	✓
				50%			9.3	4.7			3.9	2.0	6.6	Sammamish River	✓
	Kirkland, Redmond	R.IC-8	NE 85th St-Kirkland Way to 124th	55%			5.2	2.9			1.8	1.0	3.9	Sammamish River	✓
	Bothell	R.IC-24 & R-40	NE 160th Street-112th Ave to Juanita/Woodinville Wy See R-40	100%				0.0			0.0	0.0	0.0	Sammamish River	✓
	Bellevue	R.PA-2	148 Ave SE (SE 24 St to SE 28 St) New SB lane from SE 24 St to the WB I-90 on-ramp (ETP 203)	100%	0.5	72	5.2	5.2	0.5	12	0.7	0.7	5.9	Sammamish River	✓
				80%			0.0	0.0			1.1	0.9	0.9	Sammamish River	✓
				50%			9.9	5.0			4.7	2.4	7.3	Sammamish River	✓
	KCDOT	R.PA-10	NE 132 St Extension (132 Ave NE to Willows Rd Ext.)---- Construct new 3 lane arterial with CGS, bike lanes (ETP	100%			0.0	0.0			2.1	2.1	2.1	Sammamish River	✓
	Kenmore/KCDOT	R.PA-11 & R.HOV.53	68 Ave NE (Simonds Rd to SR 522)-- Construct NB HOV lane total of 5/6 lanes (ETP 22) See R.HOV-53	100%				0.0			0.0	0.0	0.0	Sammamish River	✓
	Redmond	R.PA-16	Redmond 148th Ave NE Corridor - 3 projects--- Turn lane and channelization improvements along corridor –	100%							0.7	0.7	0.7	Sammamish River	✓
	Woodinville	R.PA-26	SR202 Corridor Package (SR202/148th Ave & SR202/127th Place)--- Intersection improvements (ETP R-54)	100%							0.7	0.7	0.7	Sammamish River	✓
	WSDOT	R.PA-28 & R.AC-17	SR 202 / 140 Place NE (NE 124 St to NE 175 St)--- Widen 4/5 lanes (ETP R-43) (See R.AC-17, 18)	100%			16.5	16.5			17.5	17.5	33.9	Sammamish River	✓
	Bellevue	R.BI.8	I-90 to Bellevue SB HOV direct connection to I-90 west	100%				0.0	0.6	12	1	1.0	1.0	South Kelsey	✓
	Bellevue	R.BI.9	NB auxiliary lane I-90 to NE 8th	100%	2.7			0.0	1.5	16	3.2	3.2	3.2	South Kelsey	✓
	Bellevue	R.BI.10	Increase SR 405 to Eastbound SR 520 Ramp capacity	100%				0.0	3.0	20	8	8.0	8.0	South Kelsey	✓
				20%			88	17.6			62.7	12.5	30.1	South Kelsey	✓
	Bellevue	R.TC-23	Add Express lanes - SR 90 to SR 520	100%	3.8	132	73	73.0	15.2	21	42.6	42.6	115.6	South Kelsey	✓
	Bellevue, Newcastle	R.TC-33	Slip Ramp- South of Coal Creek Pkwy	57%	1.8				7.2	12	11.5	6.6	6.6	South Kelsey	✓

Alternative 4
Impervious Area by Basin

		Bellevue		R.CF.3	I-90 South Bellevue to Eastgate	100%	3.5	148	75.3	75.3	7.0	12	11.2	11.2	86.5	South Kelsey	✓
						45%			64.4	29.0			13.1	5.9	34.9	South Kelsey	✓
																South Kelsey	✓
		Bellevue		R.TC-12	One additional GP lanes in each direction - SR 90 To SR 520	100%	3.8	132	73	73.0	7.6	12	12.2	12.2	85.2	South Kelsey	✓
		Bellevue		R.HOV-27	SR 90 I/C Fwy to Fwy HOV ramps,	100%					5.2	28	19.4	19.4	19.4	South Kelsey	✓
		Bellevue		R.HOV-28	SR 520 Fwy to Fwy HOV ramps,	100%					6.7	28	25.0	25.0	25.0	South Kelsey	✓
		Bellevue		NM. CR-1	Lk Washington Blvd/112th Ave. SE - crossing I-405 from 106th Ave. SE to 112th Place SE - Add sidewalks	100%	0.1	30	0.4	0.4	0.1	12	0.0	0.0	0.4	South Kelsey	✓
		Renton		R.BI.1	SR 167 Interchange - Direct Connection with auxiliary lane SB SR 169 to SR 167	100%	1.2			0.0	1.5	14	2.8	2.8	2.8	Spring Brook	✓
		Renton		R.BI.14	NB Auxilliary Lane I-5 to SR 167	100%	3.2			0.0	3.2	12	5.1	5.1	5.1	Spring Brook	✓
		Tukwila,Renton		R.TC-20	Add Express lanes - SR 5 Tukwila to SR 167	80%	3.2	108	50.3	40.2	12.8	21	35.8	28.6	68.9	Spring Brook	✓
						45%			34.6	15.6			24.6	11.1	26.6	Spring Brook	✓
		Renton		R.TC-28	Add Express lanes- on SR 167 north of 180th up to I-405	100%	1.3	112	21.2	21.2	3.8	21	10.6	10.6	31.8	Spring Brook	✓
		Tuk & Renton		R.TC-29	Southern end to Express lanes - Between SR 181 and SR 167	100%	0.9				3.6	12	5.8	5.8	5.8	Spring Brook	✓
		Renton		R.TC-34	Interchange access location- SR 167	100%	1.2				2.5	12	4	4.0	4.0	Spring Brook	✓
		Renton, Kent		R.CF.8	SR 167 I-405 to Study Area Boundary	100%	6.4	112	104.3	104.3	12.8	12	20.5	20.5	124.8	Spring Brook	✓
		Renton		R.FR-10	SR 167/I-405 Interchange Add Directional Ramps for major movements	100%					2.6	28	9.7	9.7	9.7	Spring Brook	✓
						50%			71	35.5			5.3	2.7	38.2	Spring Brook	✓
		Tukwila,Renton		R.TC-9	One additional GP lanes in each direction - SR 5 Tukwila to SR 167	80%	3.2	108	50.3	40.2	6.4	12	10.2	8.2	48.4	Spring Brook	✓
						45%			34.6	15.6			7	3.2	18.7	Spring Brook	✓
		Tukwila		R.AC-35	SR 181- S 180th to S 200th	100%			5.6	5.6			2.6	2.6	8.2	Spring Brook	✓
		Tukwila		R.IC-3 & R.AC-36	SR 181 West Valley Highway/ Interurban See R.AC-36	100%										Spring Brook	✓
		Renton		R.HOV-26	SR 167 I/C Fwy to Fwy HOV ramps,	100%							12.9	12.9	12.9	Spring Brook	✓
		Renton		NM. CR-6	Jackson SW/Longacres Dr SW - crossing I-405 from S. Longacres Way to Monster Rd SW - Add sidewalk/paved	100%				0.0	0.5	13.5	0.0	0.0	0.0	Spring Brook	✓
		Tukwila		NM.P&B-19	SR-181/W. Valley Hwy - crossing I-405 from Strander Blvd to Fort Dent Way - Add bike lanes	100%					1.5	10	0.0	0.0	0.0	Spring Brook	✓
		KCDOT		R.PA-5	SE 212 Way/SE 208 St (SR 167 to Benson Rd/SR 515)--- Widen to 6 lanes + bike facilities, Transit/HOV preferential	100%			9.4	9.4			4.4	4.4	13.8	Spring Brook	✓
						100%							0.3	0.3	0.3	Spring Brook	✓
		Renton		R.PA-22	SW Grady Way (SR 167 to SR 515)--- Rechannelize and modify signals for a continuous eastbound lane (ETP R-	100%							0.0	0.0	0.0	Spring Brook	✓
		Renton		R.PA-23	SR 167 at East Valley Road--- New southbound off-ramp and signalization at East Valley Road (ETP 255)	100%							0.6	0.6	0.6	Spring Brook	✓
		Renton/ KCDOT		R.PA-24	Soos Creek Regional Links--- Placeholder for Trans-Valley Study (ETP R-115)	100%							0.0	0.0	0.0	Spring Brook	✓
						20%			58.6	11.7			40.3	8.1	19.8	Swamp	✓
		Snohomish Co		R.TC-30	Northern end to Express lanes - Between SR 527 and I-5	80%	0.9				3.6	12	5.8	4.6	4.6	Swamp	✓
		Sno Co, Lynnwood		R.CF.6	SR 525 I-405 to SR 99	100%	3	76	33.2	33.2	6.0	12	9.6	9.6	42.8	Swamp	✓
		Lynnwood		R.CF.10	I-5 at Swamp Creek - 44th to 164th	100%	4	136	79.1	79.1	4.0	12	6.4	6.4	85.5	Swamp	✓
						20%			58.6	11.7			11.5	2.3	14.0	Swamp	✓
		Sno. Co.		R.HOV-30	SR 5 I/C @ Swamp Creek Fwy HOV ramps.	100%							12.9	12.9	12.9	Swamp	✓
		King County		NM. CR-3	SR-524 (Filbert Road) - crossing I-405 from North Rd to Locust Way - Add sidewalk/paved shoulder	100%			0.0	0.0			1.9	1.9	1.9	Swamp	✓
		TOTAL												**887.7**	**2628.9**		**130**

Appendix F

Communication and Coordination

Highway Drainage and Water Quality Problems in the I-405 Corridor - King County

ATTENDEES: David Hartley
Ray Heller
Jonathan Frodge, Ph.D.

FROM: Peter Sturtevant / SEA
Jessica Habetler / SEA

DATE: October 26, 2000

We met with three representatives from King County Surface Water Management Division: David Hartley, Senior Engineer of the Regional Watershed Section, Jonathan Frodge, Ph.D., Senior Limnologist, and Ray Heller, the Bear Creek Basin Steward of the Cedar-Sammamish Watershed Team. The discussion included highlighting sources of information concerning flooding and water quality in King County. In addition, a new study which is investigating issues similar to those experienced by streams in the I-405 corridor were discussed.

Creeks which have experienced significant water quality and erosion control problems within the I-405 corridor, are May Creek, Coal Creek, and Juanita Creek. Additionally, the I-405 crossing of the Sammamish River has no water quality controls; therefore, untreated stormwater runoff enters the river at this location. Other creeks with erosion control problems include Madsen, Maplewood, and Ginger Creeks.

The primary water quality concerns in the King County area are lead and temperature. Increasing temperatures in streams throughout the county also affect water quality, especially for salmon spawning streams. The Sammamish River was singled out as being effected by increasing temperatures. Other water quality information can be obtained in the 303d listing of King County streams, compiled by the Washington department of Ecology. The 303d listing was complied from the results obtained in recent water quality data collection.

A major concern of the National Marine Fishery Service (NMFS) is documentation of impervious surface by drainage basin and its effect upon baseflows. Specifically mentioned in this conversation was Maplewood Creek, which experiences low flow problems. Also cited was the Sammamish River in which a loss in groundwater recharge has been observed.

Of specific mention was a water quality project that King County is initiating, which considers Lake Washington drainage from the Ballard Locks to Lake Sammamish. Included in this project are stormwater runoff samples being taken from bridge decks. This will be done to isolate pollutants generated by roadway traffic and attempts to quantify them. Data collection for this project will be a combined effort of WSDOT and the King County Department of Natural Resources (DNR). Approximately 20 to 30 sites will be monitored.

The report documenting these results is several years away but interim results should be available next year.

The following streams have drainage plans that have already been compiled: Soos Creek, the Lower Cedar River, Bear Creek, and May Creek. These drainage plans list drainage and water quality issues associated with the streams. While drainage plans have not been complied, flood information has been gathered on other rivers including the Sammamish River, Swamp Creek, and North Creek. The contact for the Sammamish River is Nancy Faegenburg and for North Creek is Brent Black.

Other sources of information the County felt would be helpful to this effort include their drainage complaint database and Puget Sound Chinook stream maps.

Highway Drainage and Water Quality Problems in the I-405 Corridor – City of Kirkland

ATTENDEES: Stacey Rush– City of Kirkland

FROM: Jessica Habetler / SEA

DATE: November 14, 2000

On November 14, 2000, I met with Stacey Rush, Surface Water Systems Engineer, at the City of Kirkland. Ms. Rush provided me with information from Kirkland Streams, Wetlands, and Wildlife Study, from July of 1998. This information included 2 maps. One highlighted the wetlands and streams along the I-405 corridor and the other was a Wildlife Habitat Map. Accompanying these two maps were more detailed maps for streams and creeks crossing I-405 and written descriptions of their drainage characteristics. The detailed information was provided for the following:

1. Juanita Creek's Totem Lake Tributary # 235
2. Juanita Creek's Totem Lake Tributary # 238
3. Forbes Creek (Stream # 242)
4. Everest Creek (Stream # 244)
5. Yarrow Creek (Stream #252)

Few flood issues were discussed. The only major flooding problem indicated occurs at Forbes Lake, it happens frequently with very high water levels. It is a Level 3 lake, while all other lakes in Kirkland are Level 1. It is felt that only some of the flooding problems are caused by beaver dams in the area.

Juanita Creek was mentioned as a location of particular concern. Upstream of where I-405 crosses the creek, near 122nd Avenue NE, flooding is caused by an insufficient culvert opening. The creek also experiences significant erosion and stability problems at various locations. Additionally, a drop in fish numbers east of the interstate has been observed at Juanita Creek and Forbes Creek.

A water quality monitoring program has been approved for 2001, but currently no data is available to quantify this information for Kirkland's streams. In general, some degradation is caused by the interstate, as is common for small streams in urban areas. No specific locations of concern were identified at this time.

Currently, no active streamflow monitoring being conducted by the City of Kirkland; therefore, the effects of urbanization and road building on baseflows are unknown. Ms. Rush indicated that King County might have some data on Juanita Creek flows. Another potential future source of information could be The Salmon Watch Program. The program

began in 2000; therefore, historic data has not been compiled. Typically, there are few fish east of I-405 in all City of Kirkland stream crossings.

Highway drainage and Water Quality Problems in the I-405 corridor - Snohomish County

ATTENDEES: Mo Kashani, Craig Young, Maurine Meehan, Ellen Stewart

FROM: Peter Sturtevant / SEA

DATE: November 14, 2000

I met with representatives from Snohomish County Surface Water Management Division. Mo Kashani heads the CIP Group and Craig Young is the Basin Steward for Swamp and North Creeks, whose basins are crossed by I-405.

Mo mentioned that in the early 1990s a large detention pond was constructed along Swamp Creek, just upstream of the junction of I-405 and I-5. This pond helps to relieve flooding along the lower portion of Swamp Creek in South Snohomish and Northern King Counties. Craig pointed out that Martha Lake Creek, which feeds into Swamp Creek near I-405, has a strong petroleum odor and is quite turbid, in the vicinity of I-405. He had not located the source of the problem as of this date.

Two of the most persistent problems mentioned by the County staff were: 1) poor erosion and sediment control during highway construction; WSDOT projects have commonly had excess sediment and turbidity during the wet season. 2) highway drainage facility information is often missing from County drainage maps and files. There have been several instances this past year when the County Drainage Rehabilitation Investigation Group has curtailed a field investigation where a drainage crosses a state highway, due to lack of County in-house records. There is a need for better communication with WSDOT, particularly assuring that the County has up-to-date highway drainage drawings.

With regard to mitigation for highway stormwater, the County is receptive to regional, cooperative detention projects. The County staff are also receptive to regional stream mitigation whereby local stream impacts could be mitigated through WSDOT support of wetland and riparian land acquisition elsewhere in the basin. The County's Land Acquisition Program in support of ESA has identified 24 properties within the Swamp-North-Little Bear Basins which would protect or enhance riparian and stormwater detention and might offer a cost-effective stream mitigation option for WSDOT projects. Other suggestions for mitigation included maximizing reforestation of highway ROW, similar to tree plantings that have recently occurred along the northern portion of the I-405 alignment. WSDOT could also consider working with the County and / or private land owners to upgrade and revegetate streams and ditches within one-quarter mile upstream and downstream of highway crossings.

Craig Young offered to review alignment layouts in the Snohomish County portion of the project area and offer suggestions regarding potential impacts to sensitive areas.

It was stated that WSDOT had recently completed an inventory of its highway culverts, rating them for fish passage. This information should be presented in the technical reports. (Note: I will follow up with the WSDOT Shoreline Office on this topic.)

Highway Drainage and Water Quality Problems in the I-405 Corridor – City of Renton

ATTENDEES: Ron Straka – City of Renton

FROM: Jessica Habetler / SEA

DATE: November 15, 2000

I met with Ron Straka, the Utility Engineering Supervisor from the City of Renton's Utility Systems Division – Surface Water. Abdoul Gafour, the Water Utility Engineering Supervisor, also provided some groundwater input at the end of the meeting.

Mr. Straka did not list any major flooding issues, but instead chose to list some flooding attributable to roadway runoff and nuisance flooding. Regarding roadway impact, he felt that all of the creeks that cross I-405 are affected by it. It is difficult to determine if the flooding is a direct result of roadway runoff because development has also played a significant role. In general, he stated that roadways are a large contributor to the problems experienced in all streams crossing the interstate (listed from north to south): the Gypsy subdrainage, the NE 44th Street crossing, May Creek, Cedar River, Rolling Hills Creek, and Spring Brook Creek. The Panther Creek and Wetland along Highway 167 have these same issues. Lastly, WSDOT is considering altering the NE 44th Street I-405 interchange near May Creek. The potential effects on May Creek include moving or altering the existing 72-inch crossing.

The nuisance flooding problems include Gypsy Subbasin and Rolling Hills Creek (particular attention should be paid to the bend in the creek near I-405). The Gypsy subbasin is located near SE 73rd Place and Lake Washington Boulevard on the northern end of the City of Renton. The small creek serving this basin discharges into Lake Washington. Rolling Hills Creek runs parallel to I-405 beginning at the Cedar River continuing to the south. Between South Puget Drive and State Route 515 the creek stops following I-405 and continues in a southerly direction. Lastly, at the NE 44th Street crossing of I-405, a small stream tributary to Lake Washington, has a local drainage problem.

Regarding water quality issues attributable to roadway runoff, there was no specific pollutant of concern identified. In general, the water quality problems facing the Renton area are typical for all urbanized streams in the Northwest and roadways contribute the problem. Currently, the City does not have a water quality program and; therefore, the specifics of this are unknown. Likewise, typical regional floodplain impacts and erosion control / channel stability issues hold true for Renton. No specific locations of high erosion or instability were identified.

Regarding baseflow information and how it has been affected since development of the area, I was referred to the May Creek Basin Plan and Cedar River Basin Plan. No other

information is available concerning changes in receiving water baseflows; a flow-monitoring program has not been implemented.

Some steps have already been taken to improve fish migration in streams crossed by roadways; other issues are still outstanding. Maplewood Creek was recently studied and has been modified to increase fish passage. A new fish ladder has been installed on Panther Creek at a Hwy 167 crossing. May Creek, Cedar River, and Spring Brook Creek are OK for fish passage. However, it was indicated that these and other existing crossings would need to be reevaluated for each proposed new project. Currently, the Gypsy subbasin drainage area has some fish blockage problems, but these are at culverts mostly downstream of I-405.

One other concern highlighted during the conversation on the I-405 corridor focused on Panther Creek and Wetland. The wetland is long, large, and parallels very close to Hwy 167. Any widening of this roadway would affect this sensitive wetland. A WSDOT HOV lane project was recently blocked at this location due to ESA listings.

I also briefly spoke with Abdoul Gafour (Carol Boatsman is the well protection contact) in the City's Water Department. He showed me their well protection plan and said that WSDOT has a copy but that he would send a copy to me also.

Highway drainage and Water Quality Problems in the I-405 Corridor – City of Redmond

ATTENDEES: Bob Franklin, Stormwater Engineering Division Manager
Cathy Beam, Senior Environmental Planner
Jerallyn Reutemeyer, Natural Resources Division

FROM: Jessica Habetler / SEA

DATE: November 16, 2000

On November 16, 2000, I met with Bob Franklin, Stormwater Engineering Division Manager, Catherine Beam, Senior Environmental Planner, and Jerallyn Reutemeyer of the Natural Resources Division at the City of Redmond. The discussion revolved around looking at the areas affected by the four WSDOT alternatives for potential transportation projects along the I-405 corridor. Included in this discussion were the existing problems at proposed project locations and the potential issues associated with the projects. The conversation focused around the four of us highlighting a map of Redmond creeks identifying areas of concern near proposed WSDOT project locations.

From the conversation, it became apparent that the most sensitive stream in the City of Redmond is the Bear Creek area. This stream has Puget Sound Chinook in it; therefore, every project near it is highly scrutinized. It is also managed under FEMA regulations, in the past the creek has flooded up to the edge of Avondale Road and has flooded Union Hill Road. Recent development on Union Hill Road has diked the stream reducing flooding at that location. Avondale Road has no room for further roadway widening due to the close proximity of the stream and homes, which are very close to the existing roadway. A heron rookery is also located north of Bear Creek and east of the Sammamish River. In addition, Bear Creek, along with the Sammamish River, and Evans Creek, are regulated by the Shoreline Management Act.

Marymoor Park area is also an area of special concern. It contains numerous Type 1 wetlands and a bald eagle's nest. Marymoor Park and Bear Creek are located on either side of Hwy 520 for a little under a mile of the roadway, and a widening Hwy 520 at this location would effect both areas. The proposed Phase III of the current 520 project was halted due to these and other concerns. On the East End of the park, discharge from East Lake Sammamish Parkway enters Marymoor Park eventually reaching wetlands. At this location, flooding occurs in the summer as vegetation decreases the capacity of the conveyance ditch to the wetlands and causes stormwater runoff channel backups near the road.

Willows Road parallels the Sammamish River. While the river is currently adequate, from a conveyance standpoint, additional flow will cause flooding and worsen the current water

quality problems. Potential widening of this road would also be hampered by the close proximity of constructed wetlands and a railroad to the east.

Along Fall City Road, a current flooding problem occurs near 108th Avenue NE and East Lake Sammamish Parkway. Southeast of the City of Redmond boundary, a high quality wetland is located to at the westernmost Evans Creek crossing of Fall City Road.

Along Redmond Way, the tributaries to the Sammamish River, specifically Idlewood and Peter's Creeks, are experiencing a number of stormdrainage related problems. High floodwaters are experienced at the creek crossings and significant erosion and channel stability problems have been observed. In addition, few fish have been observed upstream of the roadway in either creek. The intersection of Redmond Way and the Sammamish River currently does not experience any flooding problems.

Other tributaries to the Sammamish River are experiencing severe incising, specifically those receiving flow from 132nd Avenue NE. The crossing of a tributary at Redmond-Woodinville Road also has severe stability problems. However, this roadway would be very difficult to widen as it is located in a valley and is surrounded by steep slopes on either side of the road.

The southern part of the City also has some concerns. A local low point at Hwy 520 at NE 40th Street has flooding problems. This area eventually discharges to Lake Sammamish in a tributary to the lake near Villa Marina. At this location, significant water quality and flooding problems have also been observed. A stream further south near West Lake Sammamish Parkway and NE 36th Street also experiences fish passage problems.

In general, Redmond's water quality concerns are typical of urbanized areas in the Northwest. Specific pollutants of concern in the streams are phosphorus and oils. The phosphorous contributes to eutrophic conditions in Lake Sammamish; one result of increased nutrient loading to the lake includes alga blooms. Special measures to test stormwater for phosphorus reduction are required.

Some information will also be mailed to my attention from the City. Cathy will be sending me a sensitive areas map, and Jerallyn will be sending some streamflow / baseflow information.

Washington Department of Transportation - Stormwater problems and policies

ATTENDEES: Rick Johnson
Guy Caley
Pete Sturtevant

FROM: Peter Sturtevant / SEA

DATE: December 14, 2000.

On November 14, 2000 I met with Rick Johnson and Guy Caley at the WSDOT Northwest Regional Office in Shoreline. The subject of WSDOT stormwater treatment facilities was initially discussed. WSDOT is in the midst of a review of the proposed Western Washington Stormwater Management Manual. WSDOT is concerned about proposed requirements for new development and the trend toward larger detention ponds. WSDOT is discussing the new manual's application to highway projects and any special circumstances that this presents.

The current 140% Rule for treating new impervious surface is considered by WSDOT to be an interim guideline. Permanent stormwater management guidelines will come from the new Ecology Manual, discussed above. When that manual is issued, WSDOT expects to have up to two years to revise its Highway Runoff Manual to achieve compliance.

State policy on retrofit of existing highways was discussed. RCW 173-270-060 commits WSDOT to retrofit all existing state highways by 2015 (sooner for highways with an ADT>50,000). However, decisions to retrofit are subject to a review of financial feasibility for individual projects. Such feasibility studies occur during the design of any highway upgrade project. There is no dedicated state funding set aside specifically for state highway stormwater retrofit. The new Ecology Manual will mandate full stormwater retrofit for road projects which total more than 50 percent of the existing impervious surface.

WSDOT is interested in cooperating with local municipalities in looking at regional stormwater facilities which can cost-effectively treat both highway and non-highway runoff. WSDOT is willing to be involved in cooperative agreements for stormwater management with other agencies within a given basin. This could also include plans and strategies for regional stream restoration within the Lake Washington Basin.

WSDOT is carrying out a monitoring program of a number of emerging stormwater treatment technologies that hold promise for highway runoff. A Vortechnics device has been installed along I-405 near Beardsley. Special shoulder treatment of runoff is being monitored at a site along Highway 167 near Kent. Four different stormwater treatment devices are being installed underneath the I-5 Ship Canal Bridge, including the Downstream Defender and the StromCeptor. A multi-agency panel will review the results of monitoring of these systems. However, recommendations are still several years away.

WSDOT is looking at several other approaches to minimize stormwater impacts. There is a commitment to infiltrate treated stormwater wherever site conditions allow. Sub-grade over-excavation and backfill with granular media may prove effective in enhancing onsite storage and infiltration. Special soil amendments along adjacent pervious areas of highway, which promote local infiltration, is another promising area. This approach is being applied at projects along Highway 2 and in the southwest region of the state.

Temporary erosion control is another critical area for improvement. Erosion and sediment control plans are important components of all projects. Closer attention needs to be paid to construction phasing, particularly grading. WSDOT is open to wet-weather restrictions on construction activities, particularly grading. In this regard, construction sequencing plans can be effectively applied to assure that erosion-causing activities are minimized during the wet season. One example of an unusual erosion control requirement was given for the SR 520 / NE 40th Interchange Project in Redmond. The city required treatment of runoff by chemical coagulation as a requirement for construction to continue during wet weather. WSDOT is now requiring that erosion control facilities be inspected by a professional who is formally certified in Erosion and Sediment Control. Both the Association of General Contractors and the International Erosion Control Association give courses designed to bestow such certification.

Appendix G

Project Impact by Basin

Appendix G

I-405 Corridor Study

Number of Projects within Each Basin

BASIN	1	2	3	4	No-Action
Bear Creek	2	6	5	4	3
Cedar River	6	9	8	5	2
Coal Creek	3	4	3	2	1
Duwammish River		2	2	3	
West Lake Sammamish	1				4
East Lake Washington	11	15	11	10	5
Evans Creek		1	1	1	1
Forbes Creek	5	10	7	8	
Juanita Creek	5	10	10	11	5
Kelsey Creek	1	1			2
Lower Green River	2	6	5	8	
Little Bear Creek		1	2	2	3
Sammamish River	9	21	20	19	7
May Creek	3	4	2	2	1
North Lake Washington		2	2	1	
North Creek	8	13	12	14	6
South Kelsey Creek	10	14	9	13	6
Soos Creek	2	2	2		1
Spring Brook Creek	13	25	23	22	2
Swamp Creek	2	6	5	7	5

I-405 Corridor Study
Percentage of Basin covered by
New Impervious Area

BASIN	Alt. 1	Alt. 2	Alt. 3	Alt. 4	No-Action
Bear Creek	0.06	0.26	0.27	0.16	0.00
Cedar River	0.10	0.14	0.28	0.22	0.11
Coal Creek	0.41	0.48	0.54	0.42	0.04
Duwammish River	0.00	0.42	0.53	0.47	0.00
West Lake Sammamish	0.09	0.09	0.00	0.00	0.10
East Lake Washington	0.26	0.45	0.61	0.98	0.06
Evans Creek	0.00	0.19	0.24	0.38	0.60
Forbes Creek	0.75	1.23	0.95	1.50	0.00
Juanita Creek	0.44	0.68	0.86	1.49	0.25
Kelsey Creek	0.26	0.26	0.00	0.00	0.09
Lower Green River	0.16	1.16	1.80	1.37	0.00
Little Bear Creek	0.00	0.12	0.15	0.12	0.48
Sammamish River	0.22	0.44	0.64	0.59	0.12
May Creek	0.09	0.14	0.07	0.08	0.16
North Lake Washington	0.02	0.04	0.05	0.02	0.00
North Creek	0.33	0.85	1.17	1.51	0.31
South Kelsey Creek	0.42	1.60	2.23	3.04	0.24
Soos Creek	0.08	0.08	0.09	0.00	0.04
Spring Brook Creek	0.57	1.02	0.90	0.97	0.04
Swamp Creek	0.05	0.51	0.66	0.70	0.27

App G 2-3 NEW_Imp Area_Basin_Summ.xls

I-405 Corridor Study
NEW Impervious Area by Basin (acres)
November 20, 2000.

BASIN	Alt. 1	Alt. 2	Alt. 3	Alt. 4	No-Action	Total Basin Area
Bear Creek	5.9	24.2	24.8	15.1	0.0	9,343
Cedar River	13.2	18.9	38.6	30.3	15.4	13,809
Coal Creek	12.3	14.4	16.3	12.8	1.3	3,020
Duwammish River	0.0	3.4	4.3	3.8	0.0	816
West Lake Sammamish	6.8	6.8	0.0	0.0	7.5	7,291
East Lake Washington	33.7	59.3	79.5	128.4	8.0	13,104
Evans Creek	0.0	3.0	3.8	6.0	9.3	1,560
Forbes Creek	17.4	28.6	22	34.8	0.0	2,322
Juanita Creek	18.5	28.5	36.3	62.6	10.4	4,208
Kelsey Creek	13.7	13.7	0.0	0.0	4.5	5,291
Lower Green River	4.9	35.1	54.4	41.3	0.0	3,021
Little Bear Creek	0.0	3.6	4.5	3.6	14.6	3,022
Sammamish River	35.3	71.9	104.4	96.5	18.9	16,375
May Creek	5.4	8.4	4	4.7	9.1	5,858
North Lake Washington	0.2	0.4	0.5	0.2	0.0	1,079
North Creek	27.9	70.9	97.4	126.5	26.3	8,357
South Kelsey Creek	21.6	82.4	114.8	156.3	12.4	5,137
Soos Creek	7.1	7.1	8.9	0.0	4.1	9,408
Spring Brook Creek	81.2	145.9	128	138.0	5.7	14,293
Swamp Creek	3.3	34.5	44.3	47.0	18.0	6,733
Total	308.4	661	786.8	907.9	165.5	134,047

Appendix H

State of Washington Alternative Mitigation Policy Guidance for Aquatic Permitting Requirements from the Departments of Ecology and Fish and Wildlife

State of Washington Alternative Mitigation Policy Guidance For Aquatic Permitting Requirements from the Departments of Ecology and Fish and Wildlife

INTRODUCTION

The following is adopted as the State of Washington's Interagency Policy Guidance for evaluating aquatic mitigation alternatives. The intent of this guidance is to represent consensus on mitigation policy among the disciplines and the agencies responsible for evaluating, approving, implementing and enforcing aquatic resource mitigation.

Because stocks of salmon are genetically different, and because these stocks have associations with particular stream reaches, there will be limitations on uses of alternative mitigation in such cases. Nothing in the guidance should be assumed to direct the use of alternative mitigation when it would result in loss of at-risk fish stocks, prevent salmon recovery, or create policy of the state that would be in conflict with the Federal Endangered Species Act, Federal Clean Water Act, Native American Treaty Rights to fish habitat protection, or Department of Fish and Wildlife – Treaty Tribes Wild Salmonid policy. Alternative mitigation tools will be used only where they are the best choices for mitigating unavoidable impacts and are agreed to by the participating parties. However, where federal or local policies are more stringent than those identified in the state interagency policy guidance, the more stringent policies will have precedence for state-issued permits.

This policy guidance will assist the Departments of Ecology or Fish and Wildlife in issuing permits or reviewing actions under section 401 of the Clean Water Act, the Shoreline Management Act or Title 75 of the Hydraulics Code. The policy guidance was developed to be consistent with WDFW's mitigation policy (M5002 – *Requiring or Recommending Mitigation*). While this guidance represents consensus between agencies for a general approach to mitigation, it is not intended to supersede any existing authority or responsibility for regulatory and resource decisions of permitting agencies as they relate to site-specific conditions. Because this policy guidance is intended to address many media, the authors seek to use a standardized language, which departs from traditional syntax adopted within these disciplines. For example, water quality managers use the term "beneficial uses" where wetlands or fish and wildlife managers use "functions and values". To avoid confusion, neutral terms such as "functions" will be substituted.

Background - Increasingly, governmental programs designed to protect, enhance, and restore natural resources are expected to coordinate policy and implementation. Watersheds function as ecological units. Actions in one part of a watershed influence the remaining parts, potentially affecting its ability to function as a self-sustaining ecosystem. Regulators and applicants need to look at the watershed ecosystem as a whole when considering impacts and the use of preservation, mitigation banking, and off-site or out-of-kind mitigation as tools for salmon and

watershed recovery. Despite the agreed upon benefits of a watershed-based approach, guidance has not been in place to assist regulators and developers with the selection and evaluation of mitigation proposals for alternative watershed-based approaches.

In 1998 the State Legislature passed the Salmon Recovery Act (RCW 75.46/ESHB 2496) in response to the state's need for a coordinated approach to respond to listings of salmon and steelhead runs as threatened or endangered under the federal endangered species act (16 U.S.C. Sec. 1531 et seq.). The Legislature also recognized the need to coordinate mitigation activities, where appropriate, with the state's proposed salmon and watershed recovery programs. The Washington State Departments of Ecology, Fish and Wildlife, and Transportation, along with interested Tribes were required by this legislation to develop policy guidance to evaluate mitigation alternatives and opportunities. In addition, the Department of Natural Resources (DNR), and the Department of Community, Trade and Economic Development (CTED) have aided in the effort.

Mitigation Policy Guidance - RCW 75.46 states that the guidance shall create procedures that provide for alternative mitigation which have a low risk to the environment, yet have a high net environmental, social, and economic benefit compared to status-quo options. The guidance shall be designed to enable committees established under RCW 75.46.060 to develop and implement habitat project lists that maximize environmental benefits from project mitigation while reducing project design and permitting costs. The committees must also ensure that federal, state, treaty-right, and local environmental laws and ordinances are met. Benefits of agreed-upon state mitigation policy guidance include improved consistency with existing state and federal policies, improved predictability for better project planning, and increased flexibility for applicants and regulatory agencies to address watershed needs and limiting factors in the implementation of watershed planning goals and salmon recovery efforts. The guidance sets forth a framework for decisions to be made, and identifies appropriate mitigation strategies that are acceptable to the agencies.

The 1996 State Legislature passed the Aquatic Resources Mitigation Act (RCW 90.74) which stipulates that it is the policy of the state to authorize innovative mitigation measures by requiring state regulatory agencies to consider mitigation proposals for infrastructure projects that are timed, designed, and located in a manner to provide equal or better biological functions and values compared to traditional on-site, in-kind mitigation proposals. For infrastructure projects, the agencies may not limit the scope of options to be considered in a mitigation plan to traditional on-site, in-kind mitigation proposals. When making regulatory decisions, the agencies shall consider whether the mitigation plan provides equal or better functions and values, compared to the existing conditions, for the target resources or species identified in the mitigation plan and agreed to by the resource agencies. The factors the agencies must consider in making this decision are identified in the Hydraulic Code, the State Water Pollution Control Act, and the Aquatic Resources Mitigation Act. The mitigation policy guidance developed under the Salmon Recovery Act is required to be consistent with those criteria established under the Aquatic Resources Mitigation Act. The Departments of Ecology and Fish and Wildlife are not required to grant approval to a mitigation plan that the Departments find does not provide equal or better biological functions and values within the watershed or bay.

The 1998 Washington State Legislature passed legislation creating Chapter 90.84 RCW, Wetland Mitigation Banking, as one element of compensatory mitigation. It directed consistency with Federal Guidance on Mitigation Banking. The statute used the definition for mitigation listed in federal guidance (sequentially avoiding impacts, minimizing impacts, and compensating for remaining unavoidable impacts).

Agency and Tribal Authority - The Washington Departments of Fish and Wildlife (WDFW) and Ecology (WDOE) have the regulatory authority to require or recommend mitigation of impacts to aquatic resources for the State of Washington. Authority for state agencies to recommend or require mitigation is granted by the following:

Federal Coastal Zone Management Act
Federal Clean Water Act
Federal Endangered Species Act
Federal Fish and Wildlife Coordination Act
National Environmental Policy Act
State Water Pollution Control Act (RCW 90.48)
Shoreline Management Act (RCW 90.58)
Hydraulic Code (RCW 75.20)
Aquatic Resources Mitigation Act (RCW 90.74)
Wetlands Mitigation Banking Law (RCW 90.84)
State Environmental Policy Act (RCW 43.21C)
Growth Management Act [RCW 36.70(A)]
International Treaties on Migratory Birds

Note: Not all of these authorities rest with each agency.

Federally recognized Indian Tribes of the State of Washington possess treaty rights intended to ensure that rights retained under treaty agreements include provisions to hunt, fish, and gather within their usual and accustomed grounds. In addition, the Orrick Decision in Federal Court determined that the Tribes are guaranteed the right to fish habitat protection. When applying this guidance for mitigation site selection, any affected tribe must be consulted to ensure that no net loss of the tribal Usual and Accustomed Area will occur. Agencies and applicants need to be in contact with tribes, be cognizant of which tribes co-manage what areas, and work with the tribes on any mitigation decisions that affect the tribe. Each respective tribe adversely affected by a prospective permit or mitigation decision should be contacted directly and involved from the start. It is important to note that the Northwest Indian Fisheries Commission (NWIFC) does not act in place of individual tribes when treaty rights are concerned, and notice to the NWIFC does not constitute notice to the separate tribes.

The Washington State Department of Transportation (WSDOT) is responsible for building, operating, and maintaining the state's transportation system in an environmentally responsible manner. As such, WSDOT has a vested interest in policies affecting the management of the state's natural resources both as a permit applicant and as an agency of government. WSDOT is

committed to implementing this interagency mitigation policy guidance to assure project compliance, and to ensure that WSDOT's mitigation expenditures are directed towards those sites offering the greatest ecological benefit.

Because of it's role in providing growth management technical assistance to local governments, the Department of Community, Trade, and Economic Development (CTED) participated in the development of this policy guidance along with the required participants identified in RCW 75.46 (e.g., WDFW, Ecology, Tribes, and WSDOT). CTED is responsible for developing Best Available Science guidelines for local governments to use in the designation and protection of critical areas. The Best Available Science guidelines will serve to support the interagency mitigation policy guidance. The interagency mitigation policy guidance will provide a framework for local governments to consider as they evaluate and update mitigation sections within their Critical Area Ordinances. Use of the guidance by local governments is also intended to facilitate consistency among local ordinances in the same watershed and between the local ordinances and the state's approach to mitigation.

SPECIAL NOTE ON STORMWATER IMPACT MITIGATION

Stormwater management is a critical issue in implementing salmon recovery and watershed improvement efforts of the state. The emphasis for stormwater management should be on prevention of impacts to aquatic resources through appropriate development regulations, and best management practice applications for erosion control, water quantity and water quality treatment. The guiding principal should be to do no further harm to aquatic resources and to build into projects and plans the incremental improvements necessary to protect, restore and enhance the beneficial uses and functions of the state's water bodies.

It is the general consensus of the resource agencies of the state, as discussed at the January, 1999 salmon summit, that the best way to set priorities, create effective and cohesive recovery strategies, and get the greatest gain is to use watersheds as fundamental planning/management units for applying stormwater management strategies. The state agencies have recognized the need to take an adaptive-management and continuous-improvement approach to stormwater issues. Ecology has approved a mitigation strategy implemented by establishing Supplemental Treatment as an appropriate best management practice (BMP) per WAC 173-201(A). Supplemental Treatment may by applied to stormwater projects to result in improvements to water-quality and quantity needs in watersheds. A short summary on how Ecology will implement the Supplemental Treatment BMP is provided in the compensatory mitigation section of this document. For more detailed information please refer the Ecology Policy #1-22, and Procedure #1-23 "*Adopting and Use of Supplemental Treatment as a BMP"*.

SPECIAL NOTE ON PRESERVATION

It has been decided by the permitting agencies that, in some cases, protecting high-functioning, irreplaceable areas at substantially higher ratios may be the best ecological choice and acceptable for compensatory mitigation, as long as there is no overall loss of habitat functions. There is value gained in protecting sites that are already providing high quality functions necessary for watershed health and salmon recovery efforts. For example, protecting aquatic habitat high in the watershed serves to protect downstream resources from erosion and degradation.

Preservation may be beneficial in some circumstances because; a) larger mitigation areas can be set aside due to the higher preservation mitigation ratios; b) can ensure protection for high quality, highly functioning aquatic systems that are critical for the health of the watershed and aquatic resources that may otherwise be adversely affected; and c) preservation of an existing system removes the uncertainty of success inherent in a creation or restoration project.

Additional information on preservation can be found in the Interagency Report , "*Mitigation Tools for Special Circumstances: Preservation of High Quality Wetlands*" prepared by WSDOT and an interagency workgroup. Contact WSDOT Environmental Affairs office at (360) 705-7494 for a copy of the report.

POLICY GUIDANCE

I. REQUIRING OR RECOMMENDING MITIGATION

This policy guidance will assist the Washington Department of Fish and Wildlife and the Washington State Department of Ecology when issuing or commenting on permits, documents, appeals or compensation agreements which adversely affect aquatic resources. Agencies with permitting authority may require a specific type of mitigation (e.g. on- or off-site), if the permitting authority determines that the situation warrants it. Regulatory agencies must consider alternative mitigation proposed by the applicant using criteria set forth in this guidance document. The applicant must demonstrate to the permitting agencies that there will be a net gain to the resources. Local governments are encouraged to adopt these guidelines when requiring mitigation for impacts to critical areas.

A. Goal:

The basic goal of mitigation is to achieve no net loss of habitat functions by offsetting losses at the impact site through gains of mitigation. The goal of this interagency mitigation policy guidance is to maintain, protect, and enhance the functions of fish and wildlife habitat, wetlands and other waters of the state and to seek a net gain in those functions through restoration, creation, and enhancement.

B. Definition:

"Mitigation" means actions that shall be required or recommended to avoid or compensate for impacts to fish and other aquatic resources from a proposed project. Mitigation shall be considered and implemented, where feasible, in the following sequential order of preference. Use of the word "mitigation" is comprehensive of all three parts of the following sequence and is not to be considered as synonymous with compensatory mitigation. Complete mitigation is achieved when these mitigation elements ensure no net loss of ecological functions, wildlife, fish and aquatic resources.

Avoiding the Impact altogether by not taking a certain action or parts of an action.

Minimizing Impacts by limiting the degree or magnitude of the action and its implementation.

Compensating for the Impact by replacing and providing substitute resources or environments through creation, restoration, enhancement or preservation of similar or appropriate resource areas.

II. AVOIDANCE

FEDERAL -- If your project will require a federal permit from the Corps of Engineers, the Federal MOA, "*Memorandum of Agreement between the Environmental Protection Agency and*

the Department of the Army Concerning the Determination of Mitigation under the Clean Water Act, Section 404(b)(1) Guidelines" will apply. It states, "the determination of avoidance requirements will not be based on characteristics of the proposed projects such as need, societal value, or the nature or investment objectives of the project's sponsor". It is also important to note that per the Federal Clean Water Act and MOA requirements, avoidance measures are required so that only the "least environmentally damaging and practicable alternative (as determined by the Corps and EPA) may be permitted". Avoidance requires relocation of the proposed project if 1) alternatives are available for non-water dependent activities that do not involve special aquatic sites, or 2) alternatives are available that have less adverse impacts on the aquatic environment than the proposed impact site.

STATE -- When applying this state policy guidance, a potential site for development or alteration should have all aquatic resources delineated and project proponents should examine avoidance alternatives. The agencies will strive to avoid adverse impacts to existing aquatic systems through implementation of the Clean Water Act and State Aquatic protection laws. Decisions on avoidance may take into consideration the quality and size of the resource impacts.

Compensatory mitigation may not be used as a method to reduce environmental impacts in the decision of avoidance or when defining alternatives (e.g. in SEPA, NEPA or project permitting). Unacceptable activities may include, but are not limited to the following:

- When the activity will cause violations of state water quality numerical or anti-degradation standards
- When the activity will cause violations of toxic-effluent standards
- When the activity impacts threatened or endangered species or their habitats
- When activity will cause or contribute to permanent loss of aquatic resource functions
- When non-affecting or less affecting alternatives are available
- When the activity is determined non-water dependent per the Clean Water Act, State Shoreline Management Act, or Local Shoreline Management Plans and Programs

0 III. MINIMIZATION

Minimization refers to actions taken on a site to reduce impacts that will occur to aquatic resources. An applicant must first demonstrate to the satisfaction of the permitting agencies that avoidance of those impacts is not practicable or possible. Methods of minimization include, but are not limited to:

- Choosing the location of an impact so as to minimize the adverse effect to aquatic resource functions
- Ensuring that indirect impacts do not occur as a result of choosing an impact location or method of site alteration and development
- Avoiding creating changes in water current and circulation patterns that would interfere with the movement of sediment transport, plants, fish and wildlife
- Avoiding changes in water inundation regimes that would interfere with the distribution of native plants

- Avoiding creation of a habitat conducive to undesirable species
- Enhancing on-site aquatic-resource functions through innovative planning and construction practices
- Timing impacts to avoid interruption of critical natural cycles such as spawning, breeding or migrations seasons
- Avoiding destruction of remnant natural sites within areas already affected by development or alteration
- Avoiding impacts to features of the site that protect water quality
- Avoiding creation of an incompatible human activity or a need for on-going maintenance

IV. COMPENSATORY MITIGATION

A. **Ecology Decision Basis:** For those impacts that are determined to be unavoidable, Ecology considers these seven questions when planning compensation of unavoidable impacts:

1. What are the species, habitat types, or functions being adversely affected?

2. Is replacement or reintroduction of the species, habitat type, or functions vital to the health of the watershed, and if so, do they need to be replaced on site to maintain the necessary functions?

3. If it is determined that on-site, in-kind replacement is not necessary, are there higher priority species, habitat types, or functions that are critical or limiting within the watershed?

4. If both on- and off-site compensatory mitigation is available, will the species, habitat type, or functions proposed as off-site compensatory mitigation provide greater value to the health of the watershed than those proposed as on-site?

5. How will the proposed compensatory mitigation maintain, protect, or enhance impaired functions, or the critical or limiting functions of a watershed?

6. Will the proposed compensatory mitigation have a high likelihood of success?

7. Will the proposed compensatory mitigation be sustainable in consideration of expected future land uses?

B. **WDFW Decision Basis:** For those impacts that are determined to be unavoidable, WDFW's existing mitigation policy (M5002 – *Requiring or Recommending Mitigation*) states that priorities for compensatory mitigation location and type, in the following sequential order of preference, are:

1. On-site, in-kind

2. Off-site, in-kind

3. On-site, out-of-kind

4. Off-site, out-of-kind

Note –WDFW's preference for sequencing alternatives does not prohibit project proponents from considering off-site and/or out-of-kind actions if on-site, in-kind conditions are first considered, any ESA or state aquatic resource recovery considerations are satisfied, and the compensatory mitigation requirements outlined in Section IV Part D of this policy guidance are met. Section IV Part D is intended to help project proponents and regulatory agency staff determine the most appropriate action within the above sequence of alternatives. Other permitting agencies do not require formal sequencing of alternatives before considering the Section IV Part D requirements for compensatory mitigation. Combinations of the four types of mitigation may be acceptable to all state agencies.

C. <u>Definitions:</u> To further understand how resource agencies will determine the appropriate mitigation for the impact site's functions, the following definitions will be used in making decisions:

- "On site" means on or adjacent to the impact site or in the same stream reach, based on resource needs. It is not to be limited to property ownership or city/county boundaries that do not restrict the needs and uses of the resources.

- "In-kind" mitigation means replacing the same species, habitat type, and function as those affected. However, disturbed habitat shall not be replaced with additional disturbed habitat. In these cases the applicant must restore the site to its natural condition based on adjacent undisturbed sites, as approved by the permitting agencies.

- "Off site" means outside of the area from where the impact has occurred. Acceptable off-site mitigation must occur in the same Water Resource Inventory Area (WRIA), basin or sub-basin as the impacts, depending on affected functions, but not necessarily directly adjacent to the impacts. However, permitting agencies may approve compensatory mitigation sites outside a WRIA for projects with impacts in more than one WRIA, or when it is determined that moving to a different WRIA makes the most sense for the resource needs. For federal threatened or endangered species, mitigation must occur within the habitat supporting the same Evolutionary Significant Unit (ESU). For off-site mitigation to be acceptable, it must be demonstrated that greater functions can be achieved off site than is possible on site.

- "Out of kind" means species, habitat types and/or functions that are different than those at the impact site. For out-of-kind mitigation to be acceptable, applicants must demonstrate that the mitigation will provide an overall net gain for the resources of the watershed.

- "Special Species" means plants or animals listed by the state or federal government as threatened or endangered, and those that are candidates for listing. It also includes the priority habitats and species designated by WDFW, and those species designated as species of local concern under the Growth Management Act.

D. Compensatory Mitigation Requirements:

Exceptions to these requirements must be approved by the permitting agency or agencies.

1. **On site** is required when the greatest ecological benefits can be obtained on site. This may include, but is not limited to the following:

    a) The on-site location is critical for protecting or replacing important location-dependent functions that are lost due to project impacts.
    b) The location or natural conditions on site play a key role in larger watershed functions and health, or to a Special Species.
    c) The on-site location has a high likelihood of success and will not be highly influenced by adjacent development pressures.
    d) On site may be required in other circumstances as determined by site-specific needs or at the discretion of the permitting agencies.

2. **In kind** is required when the greatest ecological benefits for the watershed can be obtained by replacing adversely affected functions. In-kind requirements include, but are not limited to the following situations:

    a) When adversely affected functions are limiting within the watershed and are critical for replacement, as agreed to by the permitting agency.
    b) When adversely affected functions are critical to the continued health of the watershed or of a special species.
    c) When adversely affected functions are of high quality and should be replaced.
    d) When replacement of adversely affected functions may be required in other circumstances as determined by site-specific needs or at the discretion of the permitting agencies.

3. **Off site** may be acceptable in the following circumstances if the conditions for on site above do not apply and:

    a) The project proponent can demonstrate to the agencies' satisfaction that greater limiting or critical functions can be achieved off site than is possible on site.
    b) Adversely affected functions are of low quality, and an off-site location can be restored, preserved, or created to obtain a limiting factor identified for the watershed, for critical habitat for Special Species, or to provide higher quality functions than what is adversely affected.
    c) There are no reasonable on-site opportunities.
    d) On-site opportunities do not have a high likelihood of success due to development pressures or adjacent impacts to the compensatory mitigation area.
    e) Off-site enhancement and restoration opportunities may be considered to have a higher likelihood of success than on- or off-site creation options.
    f) Acceptable off-site mitigation must occur in the same Water Resource Inventory Area (WRIA), basin or sub-basin as the impacts, unless otherwise approved by the permitting agencies.
    g) If impacts occur to habitat for federally threatened or endangered species, mitigation must occur within the habitat supporting the same Evolutionary Significant Unit (ESU).

4. **Out of kind** may be acceptable in the following circumstances:

a) When the resources adversely affected provide minimal desirable function and are not considered limiting for a Special Species, or determined limiting within the watershed; or
b) When out-of-kind functions proposed are demonstrated by the proponent and agreed to by the permitting agencies, to be critical or limiting within the watershed and provide a net gain for the resources of the watershed.

5. **Preservation**

Preservation is an acceptable form of compensatory mitigation when used in combination with other forms of compensation such as creation, restoration or enhancement at the preservation site, or at a separate location. Preservation may also be used by itself, but more restrictions as outlined below will apply.

a) **Preservation in combination with other forms of compensation:**
Preservation as compensatory mitigation has been determined to be acceptable by the agencies when done in combination with creation, enhancement or restoration, providing that the criteria below are met. The criteria are designed to limit inappropriate uses, and ensure protection of high-quality sites under imminent threat of destruction or impairment of ecological functions, wildlife, or fish and aquatic resources.

i. **Preservation is most desirable when**:

- The impact area is small and impacts are occurring to a low functioning system; and
- Preservation of a high quality system occurs in the same WRIA or watershed where a resource loss has occurred; and
- When the functions lost occur within the preservation site, or can be exchanged for higher quality functions determined to be limiting by local or regional resource needs; and
- Preservation sites should include buffer areas adequate to protect the habitat and it's functions from encroachment and degradation. When the site contains large, diverse buffers that provide exceptional wildlife habitat, the buffer may be accepted as part of the ratio if agreed to by the permitting agencies.

ii. **Preservation is undesirable when**:

- Preservation sites are smaller than 3 acres, including the buffer; or
- Proposed sites are highly fragmented; or
- Proposed sites are dominated by non-native plants or animals (or non-natives are expected to spread and threaten the sites natural diversity).

iii. **Acceptable Use of Preservation --** Preservation of at-risk, high-quality habitat may be considered as part of an acceptable mitigation plan when **all** of the following criteria are met:

1) Preservation is used as a form of compensation only after the standard sequencing of mitigation (avoid, minimize, and then compensate); and

2) Creation, restoration, and enhancement opportunities have also been considered, and preservation is proposed by the applicant, and approved by the permitting agencies as the best mitigation option; and
3) The site is determined to be under imminent threat – "Sites with the potential to experience a high rate of undesirable ecological change due to on or off site activities. (Potential includes permitted, planned or perceived action); and
4) The area proposed for preservation is high quality, critical for the health of the watershed or basin. Some of the following features may be indicative of high quality sites:

- Category I or II wetland rating;
- Rare wetland type (e.g. bogs, estuaries);
- Habitat for threatened or endangered species;
- Aquatic habitat or wetland type that is rare in the area;
- A high-quality habitat that is located in a floodway, or floodplain and is documented as a frequently-flooded area, or is providing flood retention and storage;
- Provides biological and/or hydrological connectivity
- High regional or watershed importance (e.g. listed as priority site in watershed plan);
- Large size with high species diversity (plants and/or animals) and/or high abundance;
- A site that is continuous with the head of a watershed, or with a lake or pond in an upper watershed that significantly improves outflow hydrology and water quality.

b) Using Preservation Alone for Compensation:

Preservation alone shall only be used as compensatory mitigation in exceptional cases. Preservation alone shall not apply if impacts are occurring to functions that must be replaced on site, such as flood storage or water quality treatment that need to be replicated by water quality measures implemented within the project limits.

Preservation alone shall only be considered in the following circumstance:

i. The impacts shall be unavoidable; and
ii. All requirements listed in a) above for using preservation in combination, are met; and
iii. The impact site is providing minimal functions, (or is isolated and significantly degraded); and
iv. The impacts occur to relatively small sites; and
v. There are no adverse impacts to fish habitat functions; and
vi. There is no net loss of habitat functions within the watershed; and
vii. The proposed preservation site is high quality and at risk, as defined above; and
viii. Higher mitigation ratios are applied.

6. **Mitigation Banking**: Mitigation banking may be an acceptable form of mitigation for wetland, floodplain, habitat, and/or stream bank impacts. While these types of resource-

banking proposals may be considered by project applicants and permitting agencies, no federal or state guidance defining the management, limitations or use of credits for resource banking has been undertaken, with the exception of wetlands. Developing such guidance for all types of banking proposals is beyond the scope of this document. However, mitigation criteria contained throughout this document may be helpful for determining the appropriateness of the use of banks for off-site mitigation. Available specific guidance for wetland banking is provided as follows:

Wetland Mitigation Banking – As defined in RCW 90.84.010, a Wetland Mitigation Bank is a site where wetlands are restored, created, or enhanced or, in exceptional circumstances preserved expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources.

a) Credits from a mitigation bank are used as a form of compensation only for unavoidable impacts.
b) Credits and debits shall be based on acreage or other scientifically valid measure of aquatic-resource functions acceptable to the appropriate agencies.

As of February, 2000, Ecology is continuing to work with an advisory team to develop an Administrative Rule for a wetland bank certification program. Specific criteria for wetland banking and limitations on the use of banking credits will be listed in the Certification Rule (WAC 173-700) now under development. Adoption of WAC 173-700 is expected in the winter of 2001. Additional site specific restrictions on the use of bank credits will be listed in banking instruments for specific banks. It is the intent that this alternative mitigation policy guidance be consistent with any requirements developed within the banking rulemaking process. The alternative mitigation policy guidance may be used to assist project proponents and permitting agencies with decision making for the use of a wetland bank as an acceptable option for compensatory mitigation. However, decisions regarding the bank restrictions and credit acceptance should be based on any local banking agreements in place, and ultimately with the Administrative Rule, when complete.

7. **Stormwater:** Ecology has approved an off-site mitigation strategy implemented by establishing Supplemental Treatment as an appropriate best management practice (BMP) per WAC 173-201(A) for discharges permitted under Section 401 of the CWA. Supplemental Treatment may by applied to stormwater projects to result in improvements to water-quality and quantity needs in watersheds. Please note the use of Supplemental Treatment to meet stormwater discharge requirements is only to be used after Ecology has ensured that all necessary avoidance and minimization measures have been incorporated into the design, construction, or operation of the proposed project. Additionally, in order to ensure compliance with the water quality standards, applicants must provide for agency approval, a justification of how any supplemental treatment approach will improve the water quality of the water body segment receiving the new discharge. The justification may include, but is not limited to: numeric modeling techniques, ambient monitoring, biological indices, and indirect indicators such as total impervious area for treatment. For more detailed information please refer to the Ecology Policy #1-22, and Procedure #1-23 "*Adopting and Use of Supplemental Treatment as a BMP"*.

a) How to Apply Stormwater Off-Site Supplemental Treatment BMP:

1) A stormwater discharge will not be allowed if the new effluent will increase any 303(d)-listed parameter, or does not meet the Total Maximum Daily Load (TMDL) requirements defined for the discharge reach;
2) For new discharges, the water quality standards must be met.
3) Compliance with the water quality standards shall be obtained through on-site application of BMPs where reasonable as determined by Ecology.
4) If after on-site application of BMPs, it is determined that the water quality standards can not reasonably be met, off-site Supplemental Treatment shall be applied as follows:
    a) The off-site treatment shall occur within the same receiving water as the new discharge, and within the allowable dilution zone as determined by Ecology, and
    b) The additional off-site supplemental treatment will be required to compensate for the increase from the new discharge not being treated at the new discharge site, and a combination of the on- and off-site treatment shall result in a net improvement to water quality within the dilution zone.
    c) The applicant shall demonstrate that the Supplemental Treatment BMP may reduce background loadings to provide additional assimilative capacity for proposed projects. Background loadings may be reduced by meeting one of the following criteria:
        i. For 303(d) listed waters, the off-site treatment shall reduce the chemical parameters that are identified as limiting within the reach; or
        ii. For non-303(d) listed waters, the off-site treatment shall apply one of the following justifications for permitting agency approval:
            a) Parameter based – Supplemental Treatment BMPs must remove the same pollutant off-site as is being discharged at the new discharge site, and must result in a net reduction of that pollutant within the discharge reach as averaged between the on and off-site treatments; or
            b) Source based -- Provide in-kind treatment replacements (i.e. additional off-site highway runoff treatment or retrofits for highway runoff impacts); or
            c) Quantity based -- Provide flood management and erosion control where stormwater quantity or erosion is the problem identified for the receiving water.

In all cases, Ecology reserves the right to deny the discharge if it is determined that there will be unacceptable or unmitigatable impacts to waters of the state.

W. OTHER REQUIREMENTS OF AQUATIC-RESOURCE FUNCTIONS MITIGATION

~~1.~~ When determined necessary by the permitting agencies, project impacts and mitigation success should be measured with the Habitat Evaluation Procedure (HEP), the Washington State Wetlands Functional Assessment Method (WSWFAM), photographic documentation or other methods acceptable to the permitting agencies.

2. Compensation techniques should be based on best available science. Best Available Science may:
   a) Include experimental techniques that will require higher replacement ratios until the method is tested and determined a successful form of mitigation;
   b) Advise mitigation to be performed as part of a mitigation bank, or
   c) Require implementation of a fully functional system prior to project impacts.

3. Cumulative impacts of mitigation strategies used within the watershed should be taken into consideration, and appropriate measures utilized to avoid or minimize further degradation of the resources. Permitting decisions for unavoidable project impacts may take into consideration the benefits or adverse impacts of other compensatory mitigation, watershed restoration or recovery projects, or impact sites within the watershed, WRIA or basin.

4. Mitigation measures are an integral part of a construction project and shall be completed before or during project construction.

5. Compensatory mitigation that must be implemented after project construction, or requires a long time to reach replacement functions, shall include additional acreage or water-quality measures to mitigate for those losses at the impact site over time.

6. The permitting agencies shall make the determination of the project impacts, the significance of impacts, the type and amount of compensation required after implementing the mitigation sequence, and the level of replacement functions achieved. The permitting agencies shall base their determinations on the best available information, including the applicant's plans and specifications. For large projects with potentially significant impacts, determinations may be based on review of studies required and approved by the permitting agencies.

7. In order to save time and resources of both the applicant and the state, conceptual mitigation plans should be discussed with the lead permitting agency prior to preparing a detailed mitigation plan.

8. Mitigation plans shall be required for projects with significant impacts and shall include, at a minimum, the following:

   - Baseline impact site conditions
   - Quantitative and spatial estimate of impacts

- Proposed avoidance, minimization, and rectification measures
- Statement of need for compensation / justification of why impacts are unavoidable
- Goals and objectives of compensation
- Detailed implementation plan
- Adequate replacement ratio to compensate for temporal losses as negotiated with permitting agencies
- Performance standards to measure whether goals are being reached
- Maps and drawings of proposal
- Operation and maintenance plans (including who will perform)
- Monitoring and evaluation plans (including schedules)
- Contingency plans, including corrective actions that will be taken if mitigation developments do not meet goals and objectives
- Any agreements on performance bonds or other guarantees that the proponent will fulfill mitigation, operation and maintenance, monitoring, and contingency plan.

9. Mitigation plans must include a monitoring plan. The monitoring plan shall include a monitoring schedule of adequate frequency and duration to assure success for the stated goals and performance standards (e.g. hydrology, initial plant success and long-term survival, control of invasive species, fish and wildlife resources, habitat structure and system complexity). The monitoring schedule will vary depending on site conditions and mitigation goals. Early and frequent site monitoring will be needed to address success of elements such as hydrology, plant establishment, and to control any invasive species. Less frequent monitoring may be needed for other elements of the plan.

10. Reasonable thresholds for determining success in achieving the desired functions and goals of a compensation project should be agreed upon prior to approval of a compensation proposal. Performance standards may include establishment of water regime, survival and establishment of vegetative plantings, fish and wildlife use, resistance to invasion by exotic species, or other measurable ecological parameters. Greater uncertainty will necessitate larger compensation ratios.

11. If the project mitigation is failing and the identified contingency measures and corrective actions are not successful, or an unanticipated failure occurs that is not addressed by the stated contingencies, the applicant must contact the permitting agencies and work with the agencies using an adaptive management approach to address how to best achieve the stated performance standards for successful mitigation.

12. When determined necessary by the permitting agencies, a performance bond, letter of credit, escrow account, or other written financial guarantee may be accepted or required to ensure a project proponent will fulfill mitigation requirements, operation and maintenance, monitoring, and contingency plans. The amount of the bond should cover the costs plus 10 percent. A performance bond shall not be required in situations where prior agreements precluding the use of performance bonds have been instituted with a project proponent.

13. The mitigation site shall be protected permanently or at a minimum for the life of the project, unless otherwise approved by the permitting agencies. This protection shall be cited through conservation easement, deed restriction, donation or other legally binding

method to WDFW, the Department of Natural Resources (DNR), a private land trust, non-profit organization, or local government with restrictive easement. This may include land transfer fees, operations and maintenance costs.

14. Compliance monitoring may be performed by the agencies through routine site inspections, review of monitoring reports, and response to reports of non-compliance. Access agreements must be made part of the permit requirements.

15. A commitment by applicants to complete mitigation requirements shall be documented in one or more of the following ways:

    - Mitigation plan approved by the regulatory agencies.
    - Federal Energy Regulatory Commission (FERC) Order.
    - Conditions on an environmental permit.
    - Conservation easement.
    - Energy Facility Site Evaluation Council (EFSEC) site certification.
    - Agency Mitigation Contract

    To ensure that the required mitigation was satisfactorily completed, such mitigation should be confirmed by the permitting agency.

16. Project proponent pays mitigation costs. Mitigation costs may include but are not limited to:

    - Studies to determine impacts and mitigation needs.
    - Alteration of project design in response to sequencing requirements
    - Planning, design, and construction of mitigation features.
    - Operation and maintenance of mitigation measures for duration of project (including personnel).
    - Monitoring success of mitigation measures performance standards.
    - Contingency costs associated with non-compliance with permit conditions or non-attainment of performance standards.

APPENDIX I

Background Information for Cumulative Effects

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1.0 CUMULATIVE EFFECTS

The Council on Environmental Quality's regulations implementing NEPA define cumulative effects as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR Section 1508.7). For the I-405 Corridor Program, the actions being evaluated are the proposed programmatic transportation improvements throughout the I-405 corridor in combination with past, present, and future land use development and other relevant non-project actions primarily within the four-county central Puget Sound region comprised of King, Kitsap, Pierce, and Snohomish counties.

1.1 Scope of Cumulative Effects Analysis

Scoping for the cumulative effects analyses was conducted to identify: (1) important cumulative effects issues; (2) critical resources that should be evaluated for potential cumulative effects; (3) geographic (spatial) boundaries for evaluating potential effects; (4) temporal (time frame) boundaries for each analysis; and (5) relevant past, present, and future actions that could affect the resources, ecosystems, and human communities of concern. This scoping ensured that the analyses were focused on those effects that were truly meaningful, and is consistent with guidelines that recommend cumulative effects analyses "count what counts."

Scoping for the cumulative effects analyses relied on information gained throughout the I-405 Corridor Program EIS process. The scope of the analyses was based on public and agency input requested during formal scoping meetings early in the EIS process; informal input received from the public and agencies as a result of public meetings; responses to I-405 Corridor Program newsletters and questionnaires; feedback from the Steering, Citizens, and Executive committees; and the results of prior research and technical analyses of direct and secondary effects conducted as part of the I-405 Corridor Program Draft EIS discipline studies.

1.1.1 Critical Resources

Geographic critical resources scoped for detailed evaluation of cumulative effects included: air quality; energy; surface water; wetlands; fish and aquatic habitat; and farmlands. These were scoped based on their heightened importance within the central Puget Sound region and/or I-405 corridor and their potential for substantial cumulative effects related to proposed I-405 Corridor Program improvements in combination with other foreseeable actions. Several reviewing agencies questioned whether energy and farmlands rose to the level that they should be scoped for analysis of potential cumulative effects. After further consideration it was agreed that analysis of these two elements would be included.

1.1.2 Geographic Boundaries

Geographic boundaries for evaluating potential cumulative effects were identified for each critical resource based on a number of factors. First, a geographic boundary for each resource analysis was identified by expanding the area of analysis to the point at which all potentially significant cumulative effects would be captured, and beyond which the resource would not be substantially affected. For analyses of natural environment elements such as fish and aquatic

habitat, the most meaningful natural boundary (in this case, the affected watershed[s]) was then identified and used as the geographic boundary for analyses. This does not mean that substantial cumulative effects were necessarily found to occur within these geographic units. Where natural boundaries were not meaningful, such as for energy, a different analytical boundary was selected that would be meaningful. The regulatory interests of agencies with jurisdiction also influenced some analytical boundaries, such as for air quality.

1.1.3 Temporal Boundaries

Similar to the geographic boundaries for evaluating potential cumulative effects, temporal boundaries also were identified for each resource analysis depending on the accumulation characteristics of the effects being assessed and the regulatory interests of agencies with jurisdiction. For most analyses of critical resources, year 2030 was selected as the future temporal boundary because it is the horizon year for *Destination 2030*, the 2001 update of the Metropolitan Transportation Plan, and encompasses *VISION 2020*, the region's long-range growth management, economic development, and transportation strategy. As discussed below, implementation of *VISION 2020* and the planned land use development that would result are by far the most consequential reasonable foreseeable actions that overlap geographically and temporally with the I-405 Corridor Program alternatives.

The cumulative effects of the No Action Alternative, which assumes implementation of VISION 2020 and programmed and funded transportation improvements, were identified as the most meaningful baseline for comparing potential cumulative effects of the action alternatives on critical resources, ecosystems, and human communities of concern. Overall, the magnitude of effect attributable to the I-405 Corridor Program action alternatives relative to all other past, present, and future actions is expected to generally diminish as the future 2020 design year for the I-405 Corridor Program approaches.

1.1.4 Framework for Cumulative Effects Analyses

The 2001 update of the Metropolitan Transportation Plan (MTP), referred to as *Destination 2030*, includes many of the transit, freeway, and arterial improvements contained in the I-405 Corridor Program action alternatives. The environmental effects of these I-405 corridor improvements and all other proposed transportation investments in the region were reviewed at a programmatic level in the *Final EIS for Destination 2030, The Metropolitan Transportation Plan for the Central Puget Sound Region* (Puget Sound Regional Council, May 2001), which is incorporated here by reference. The potential cumulative effects of these improvements are re-evaluated here in slightly different combinations than in *Destination 2030* (as the I-405 Corridor Program action alternatives), and they are combined with some transportation improvements that were not included in *Destination 2030*. Nonetheless, the *Final EIS for Destination 2030* provides a useful point of reference for assessing the magnitude and significance of the I-405 Corridor Program alternatives.

The Puget Sound Regional Council (PSRC) 20-year projections of growth in households and employment within the central Puget Sound region provided a partial basis for evaluating the geographic distribution of potential cumulative effects on critical resources, ecosystems, and human communities. In order to accomplish this, the PSRC land use forecasting model (DRAM/EMPAL) was used because the study area is located within the four counties covered by

the PSRC. This is the same forecasting model used by the PSRC to develop and update the MTP. For the I-405 Corridor Program forecasts and analyses, the proposed transportation improvements contained within each alternative were entered into the DRAM/EMPAL model in the form of increased access and mobility. King County, Snohomish County, and the PSRC also were consulted in order to gain an understanding of issues related to model outputs.

1.2 Relationship to Metropolitan Transportation Plan and Other Regional Actions

1.2.1 Metropolitan Transportation Plan

Destination 2030 is the 2001 update of the 1995 Metropolitan Transportation Plan (MTP). *Destination 2030,* operating as the transportation element of VISION 2020, emphasizes an integrated multi-modal transportation system and describes the regionally significant modal components of that system. The MTP serves as a planning tool used to identify regional transportation problems and analyze and develop regional solutions, and it serves as a focus for required state and regional transportation system performance monitoring, particularly for the federally mandated congestion management system.

Destination 2030 supports a balanced multi-modal transportation system that provides options to users, but the plan recognizes that capacity enhancements are needed to improve mobility on the region's roadways. Under *Destination 2030* vehicle miles traveled (VMT) is expected to increase by 45 percent and population by 50 percent over the next 30 years. To address this growth, the plan calls for an aggressive program of transportation investments. With these investments, the growth in travel demand can be accommodated with relatively minor impacts on system performance, such as a 2 percent increase in congestion (PM peak) in 2030.

The Metropolitan Transportation System (MTS), which is the system component of *Destination 2030,* includes the following major elements:

Roadways. The roadway and high-occupancy vehicle (HOV) systems are integral components of the region's transportation system and will continue to be into the foreseeable future. Individual streets and roads do not function independently, but rather form a network through which traffic flows and connects to regional freeways. *Destination 2030* includes improvements on principal arterials and arterial HOV lanes, and adds general-purpose and HOV lane miles to the interstate and state route system in the four-county region.

Transit. The transit component is comprised of major regional transit services and facilities that provide public transportation access between major regional activities centers, connecting designated urban centers and major regional employment locations. Regional transit services can provide an alternate travel mode in congested corridors. In addition to the region's planned fixed-guideway HCT (light rail and commuter rail) and passenger-only ferry service, transit services are also represented by the transportation facilities they use – general-purpose lanes, HOV lanes, and exclusive transit rights-of-way. Regional transit facilities include major park-and-ride lots, transit centers, and ferry terminals.

Non-Motorized Transportation System. This component of the MTS includes pedestrian improvement zones located in designated urban centers and regional transit station areas including bus, rail, and ferry facilities.

1.2.2 I-405 Corridor Program Improvements Contained in Destination 2030

All of the core projects and strategies in the four action alternatives developed for the I-405 Corridor Program are included in *Destination 2030*. These transportation improvement projects and strategies are in response to the planned growth under the existing jurisdictional comprehensive plans, which in turn conform to the regional planned growth under *VISION 2020*. *Destination 2030* includes the I-405 study arterial, transit, and freeway improvements, and includes two general-purpose lanes in each direction on I-405. These additional lanes are included in Alternative 3.

The I-405 Corridor Program alternatives do not include all the HCT facilities that are included in *Destination 2030.* Links completing the HCT network around the region, such as north to Everett by 2030, are not included. Alternatives 1 and 2 do include the following fixed-guideway HCT routes and stations: Seattle to Issaquah across Mercer Island/I-90; SeaTac to Totem Lake in the I-405 corridor; and Bellevue to Redmond. In addition, the MTP uses HOV 2+, while the I-405 Corridor Program study uses HOV 3+ in the alternatives. Analysis showed that the HOV use along I-405 does not vary much among the study alternatives since the number of HOV lanes remains constant across alternatives. HOV 3+ use ranges from 3 to 4 percent of vehicles in the north end, and up to 10 percent in the south end of the corridor.

Appendix B identifies the projects within each alternative for the I-405 Corridor Program. The lists of projects included in the *Destination 2030* are found in Appendix 9 – Project List and the Supplemental Destination 2030 Project List of *Destination 2030*.

In addition, reasonably foreseeable federal, non-federal, and private actions identified during scoping that could be cumulative with the I-405 Corridor Program action alternatives are already addressed within the *Final EIS for Destination 2030* (May 2001). The most notable among these are the following, which are discussed in greater detail below:

- Trans-Lake Washington Project
- I-90 HOV transit improvements and lane additions between I-5 and I-405
- Sound Transit Phase II
- VISION 2020 proposed long-term regional land use plan

1.2.3 Trans-Lake Washington Project

WSDOT and Sound Transit have moved into the environmental analysis, documentation, and review phase of the Trans-Lake project to study options for crossing Lake Washington north of I-90, including the SR 520 bridge. In this phase, the recommendations from the study committee, as well as alternatives suggested by other community members, agencies, and advocacy groups, will be evaluated to determine the recommendations' value in improving mobility, their impacts on the environment and affected communities, and the steps that may need to be taken to avoid or mitigate negative impacts or to add positive impacts. An EIS will be prepared as part of the review process. The environmental analysis, documentation, and review process is expected to conclude in 2003. HCT across Lake Washington north of I-90 is not included in the I-405 Corridor Program or *Destination 2030*; the HCT is on the I-90 facility from the I-405 Interchange to downtown Seattle in Alternatives 1 and 2.

1.2.4 I-90 Transit Improvements and Lane Additions

HCT is assumed to operate along I-90 from Seattle to Issaquah by 2020 in Alternatives 1 and 2, and in *Destination 2030*. A Sound Transit study is currently looking at ways to improve transit on the I-90 bridge. It is not clear at this point if I-90 will convert the reversible express lanes to two-way transit operation, or whether they will remain as reversible lanes.

1.2.5 Sound Transit Phase II

Since 1996, Sound Transit has been implementing Sound Move, the first phase of the voter approved regional transit long-range vision that includes regional bus service, HOV access improvements, park-and-ride lots, and commuter rail and light rail. Except for commuter and light rail facilities, a variety of these regional HCT investments are being implemented along the I-405 corridor. At the present time all of the Sound Move commitments programmed for the I-405 corridor should be completed by 2006, the original completion year for Phase I. All Sound Move commitments are included in *Destination 2030* and the I-405 Corridor Program alternatives.

The Sound Transit Board is now considering substantial changes to routes and segment phasing for LINK light rail in Seattle, which would extend the first phase Sound Move implementation period for that element alone out to approximately 2009. Sound Transit has targeted 2004 as the probable year for a Phase II public vote on a new set of proposed regional HCT investments to be implemented between 2006 and 2016 or 2020. Assuming a positive vote outcome, the plan would provide additional (but as yet unspecified) HCT facilities and services to east King County, including jurisdictions within the I-405 corridor.

In the I-405 Corridor Program Alternatives 1 and 2, HCT was assumed to operate as a center-to-center fixed-guideway system utilizing BNSF and I-405 right-of-way along the length of I-405, with extensions to Redmond via SR 520 and to Issaquah via I-90 corridor alignments. Alternative 3 assumes that the high-capacity transit element would take the form of an advanced bus rapid transit system, primarily using HOV lanes, operating on I-405, SR 520, and I-90.

1.2.6 VISION 2020

Destination 2030 functions as the transportation element of *VISION 2020*. *VISION 2020* describes a regional land use pattern consistent with and supportive of the state's GMA policies (Growth Management Act). *Destination 2030* provides the regional transportation system to support the planned growth. The local comprehensive plans for cities in the study area were developed within the framework of *VISION 2020*. The alternatives for the I-405 study are consistent with all local jurisdictions' adopted land use zoning. The I-405 Corridor Program action alternatives are consistent with GMA in that they support implementation of the envisioned regional land use pattern.

1.3 Land Use, Development, and Transportation in the Region and Study Area

1.3.1 Regulatory Trends

Through the late 1980s and 1990s, new regulatory policies at the state, regional, and local levels were enacted that defined the boundaries within which growth would be accommodated and the amount of density that each city will need to accommodate over a 20-year horizon.

Washington State Growth Management Act

With little statewide or regional direction on growth, and the continued growth pattern, citizens' concerns triggered the adoption of the Washington State Growth Management Act (GMA) in 1990. The Act defined urban and rural growth areas (UGAs), designated urban centers (which came about through VISION 2020 and Countywide Planning Policies), established density targets in those urban centers, and established minimum levels of services on statewide infrastructure. For further detail see Section 3.13 and the *I-405 Corridor Program Draft Land Use Plans and Policies Expertise Report* (DEA, 2001a).

VISION 2020

The Puget Sound Regional Council (PSRC) adopted the update of *VISION 2020* in 1995. VISION 2020 serves as a long-range growth management, economic, and transportation strategy. It establishes a multiple-center approach to development that promotes a jobs/housing balance and plans for needed transportation improvements, specifying that improvements should occur at the same time as employment growth to implement the infrastructure concurrency requirements of GMA. *VISION 2020* focuses growth into the Urban Growth Area (UGA) defined by each county. The Metropolitan Transportation Plan (MTP) was adopted in 1995 as the transportation element of VISION 2020.

Metropolitan Transportation Plan

As noted, the MTP was initially adopted in 1995. The MTP is a long-range plan to guide transportation investments in the central Puget Sound region. It includes specific provisions relevant to the I-405 corridor, including policies to support development of dense centers and a greater mix of land uses, connected by a network of transit and non-motorized modes of travel. Key components of the MTP include regional transportation pricing strategies, freeway and arterial HOV systems, facilities for pedestrians and bicycles, travel demand management, and establishment of high-capacity transit modes along congested corridors that connect urban centers. The Puget Sound Regional Council updated the 1995 MTP in a revised plan titled *Destination 2030* in May 2001. The basic building block of *Destination 2030* is *VISION 2020*, with the same emphasis on coordinated city, county, port, and transit agency plans, and adopted multi-county and countywide planning policies. Destination 2030 takes into account the different growth patterns in the region and calls for focused growth in the urban centers. It also acknowledges implementation of a light rail system in the 2010 horizon with subsequent phases. *Destination 2030* takes an important step in calling for reduction of congestion points and includes many of the I-405 corridor improvements within the 2010 and 2030 horizons. The plan takes the existing list of projects from *VISION 2020* and revises them based on PSRC modeling.

It also includes a 2001–2010 "action strategy," which calls for a regional phasing plan to determine which transportation projects should be built first for the best land use effect.

County-Wide Planning Policies

King County, Pierce County, and Snohomish County, working with the local cities, took the lead in developing and adopting County-Wide Planning Policies (CWPP), which integrated land use planning with transportation planning policies. Cities, including the Eastside cities within the I-405 study area, adopted the CWPP as one regional implementation tool of the GMA and VISION 2020 policies.

The CWPP establish the urban center concept, which is beginning to take form within the designated UGA. Some of the urban centers are in the I-405 corridor area and planned infrastructure improvements will affect their long-term viability.

All of the local jurisdictions in the I-405 Corridor Program study area have adopted comprehensive plans in accordance with requirements of GMA, the CWPP and the PSRC multi-county planning policies. These comprehensive plans include a transportation element that has been reviewed and certified by the PSRC as conforming to the transportation planning elements of the GMA, VISION 2020, and the MTP. There are 80 adopted comprehensive plans in the Puget Sound region, 74 of which have certified transportation elements. The concurrency requirements of transportation elements require that key infrastructures be built or planned for within a 6-year time frame of any proposed development. The I-405 Corridor Program alternatives are generally supportive of the applicable jurisdictional local transportation plans.

1.3.2 Historical Land Use Changes and Trends

The Puget Sound region has experienced tremendous growth in two large cycles**,** one in the 1960s and another in the 1980s and 1990s. The Puget Sound region is still growing in 2001, with annual growth rates projected at 1.1 to 2.0 percent out to 2030 (PSRC, 2001). Prior to the 1970s there was strong growth in the region with federal spending on aviation, expansion of military installations, import/export services, and related industrial goods. In the mid-1970s, the growth slowed and the Puget Sound region felt the "brakes" of the economy. In the mid-1980s, the region experienced a revival of the economy with the arrival of Microsoft and the "high-tech" industry, increased spending on military technology with Boeing, and an upturn in the national economy. While the growth rate was substantial in the 1960s, the current predominant Eastside land uses did not emerge until the 1980s when the area transitioned from rural/suburban, to suburban/urban with identifiable urban centers.

The Eastside (communities east of Lake Washington) began the Twentieth Century as a rural area. Development did not begin in earnest until after the completion of the first Lake Washington floating bridge across Mercer Island in 1940. The bridge dramatically decreased the time it took to travel between Seattle and the Eastside. During the next twenty years the previously rural Eastside was transformed into a major suburb of Seattle, with development focused in Bellevue and the other neighborhoods having easy access to U.S. 10 (now I-90). The second major phase in the contemporary development of the Eastside began when the second Lake Washington floating bridge was completed in 1963. The opening of SR 520 facilitated access and development in the 1970s and early 1980s of the northern and northeastern portions

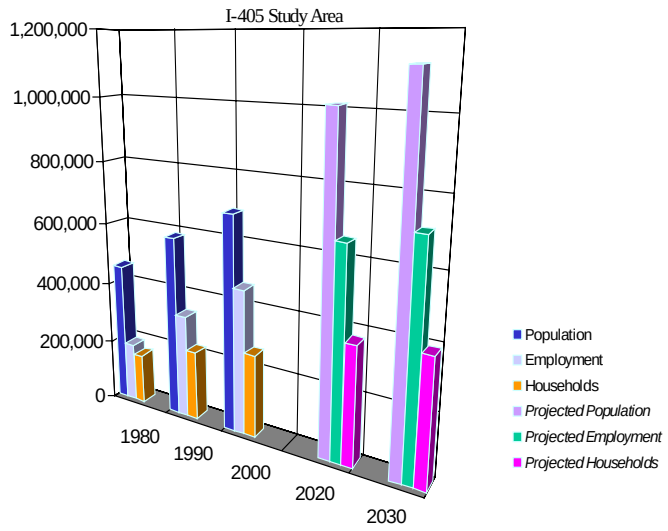
of the Eastside areas that had previously been difficult to access from Seattle. During the period the Eastside also became an important location for businesses and jobs, which increased 400 percent between 1960 and 1980.

The first businesses were retail, serving the needs of the residents, but from 1990 to 1997 the population increased by nearly 60,000 people and employment increased by 80,000 jobs as major international companies like Microsoft located on the Eastside and Boeing, the Eastside's biggest employer, expanded. Roadways were expanded and built in response to the employment and population growth. The land use plans and zoning currently approved for the Eastside anticipate considerable development over the next 30 years as well.

In the 1990s, towns that were once "bedroom" communities, such as Bellevue and Redmond, were transformed into major employment and commercial centers. The long-term regional growth trend has been toward population dispersion outward from Seattle and, late in the 1990s, from the Eastside cities eastward into agricultural and forested areas.

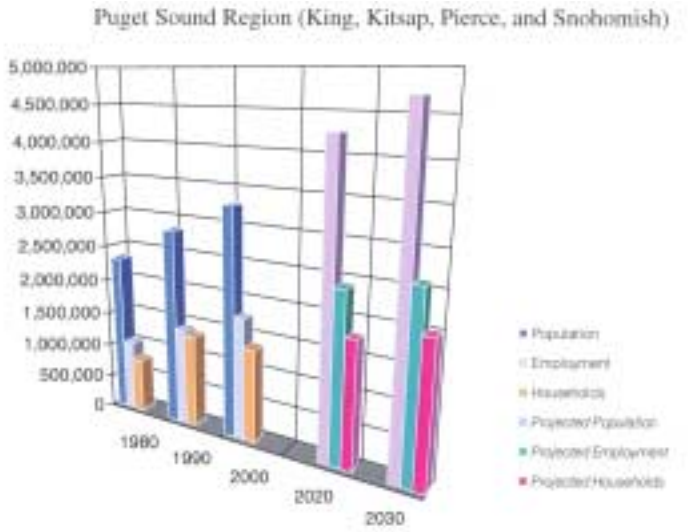
The I-405 corridor experienced the greatest growth between 1980 and 2000 as reflected in Figure 1.3-1. The growth that took place in employment and households was above the regional average.

Figure 1.3-1: Population, Employment, and Household Trends from 1980 to 2000 and Projections at 2020 and 2030



Between 2000 and 2030 the region is projected to add about 1.5 million people, 2 million new households, and 700,000 new jobs. The population in the region is expected to grow at an annual rate of 1.2 percent over the next 30 years, a substantial slowdown from the 2.0 percent pace of the 1960-00 period. By 2030, the population, as shown in Figure 1.3-2 is expected to reach 4.7 million, a 44 percent increase from the 2000 level.

Figure 1.3-2: Population, Employment, and Household Trends from 1980 to 2000 and Projections at 2020 and 2030



The trend of declining household size is expected to continue in the future, but at a more moderate pace. The updated forecasts project that, by 2030, there will be two million households in the region, a 50 percent increase above the 2000 total. The region's average household size is expected to be 2.3 people per household by the year 2030, down from the 2000 level of 2.5 persons per household (2001 MTP Baseline Technical Report – June 2000).

In the 1990s, aerospace was a major sector of the Puget Sound area's employment and economic base. In 1999, aerospace employment represented 40 percent of the total manufacturing sector jobs. Yet while aerospace was a substantial factor in the economy, the pre-packaged software industry accounted for 13 percent of the region's earnings in 1999. Recent forecasts indicate a shift in the regional economy to a new and growing sector – trade and service industries.

The forecast for 2030 economic performance will be tied to the growth in the trade and service industries. Projections suggest that trade and services will be the main growth sectors at an annual growth rate of about 1 percent or more between 2000 and 2030. The region is projected to have 1.5 million trade and service jobs, about 58 percent of all employment forecast through the year 2030 (2001 MTP Baseline Technical Report – June 2000).

1.3.3 Regional Land Use Trends and Growth

Summary of Population and Housing Trends in the Region

The Puget Sound region has experienced substantial growth in population during the past four decades. In the 1980s, the annual growth rate was approximately 2 percent with an estimated population of 2.7 million in 1990. The actual population ended up at more than 3 million in 1990, due to the in-migration drawn by a strong economy.

The substantial growth of in-migration of people took place between 1988 and 1989, when nearly 50,000 more people moved into this region than moved out. This exceeded the region's average of 20,000 for the previous 5 years. Population projections (Figure 1.3-2) indicate that by 2030, nearly 5 million people will be living within the region.

The housing trends are shown in Figure 1.3-2 from 1980 to 2030 for the region. Between 1995 and 1997 the number of residential units permitted increased regionally, with the number in King and Snohomish counties rising the fastest. Pierce and Kitsap counties experienced increases in permits from 1995 to 1996, but in 1997 fell 6 and 18 percent, respectively. Permits for single-family housing continued at a high level during the late 1990s and constituted the largest share of residential dwelling units.

The Growth Management Act (GMA), as discussed in regulatory trends, led to the establishment of the Urban Growth Area (UGA), a boundary for growth and designation of urban centers to absorb the growth. The UGA is likely to become denser as an additional million people populate the Puget Sound region by 2020. By the year 2030, a total of 1.7 million additional people are forecast to live in the region (Central Puget Sound Region - Growth Context Paper - PSRC Oct. 1999).

The UGA requires an effective transportation infrastructure, to provide access to the employment centers as well as the low-density suburban areas. The suburban areas are attractive due to lower land costs, but are often remote from employment opportunities. When housing is developed near employment centers, it may not be affordable to local employees, who then look further out – an ongoing development trend in east King County.

Summary of Employment in the Region

The Puget Sound region has experienced continued growth of both the manufacturing (aerospace and aviation) and service-oriented (software, computer technologies, and biotechnology) economic sectors. The I-405 corridor has a mix of both sectors, with aerospace manufacturing concentrated in the Kent and Renton areas and the software/high technology firms in Redmond, Bellevue, and the central and eastern areas. Both sectors generate high volumes of traffic on the freeway system.

Location analysis of selected industry clusters in the central Puget Sound region shows that certain industry groups tend to concentrate within particular parts of the region. Concentration of particular types of employment activity offer opportunities to examine transformations in the economic geography and travel behavior associated with different employment patterns, as discussed below (Central Puget Sound Region - Growth Context Paper - PSRC Oct. 1999).

In 1998, there were 190 aerospace firms in the region employing over 112,000 persons. The Boeing Company employs nearly 100,000 of these employees. Aerospace is concentrated, even after recent transfers among facilities, in south Seattle, Renton, Everett, and the Kent Valley. Non-Boeing aerospace employment (around 15,000 employees) tends to be located near the existing Boeing facilities.

Software firms employed nearly 30,000 persons in 1998. There were over 900 firms, 93 percent of which are small firms employing fewer than 50 employees. Half of all software employment is with Microsoft and 17 percent of the employment is with firms employing fewer than

50 employees. This has been an extremely high growth industry during the 1990s, with employment increasing by over 400 percent. These firms are primarily concentrated in downtown Seattle, Bellevue, Redmond, and to a lesser degree in other parts of east King County.

Biotechnology employment is concentrated primarily in downtown Seattle and around the University of Washington; some employment is located in the "high tech corridor" along I-405 in north King County and in Snohomish County. In 1998, biotechnology had an employment of 8,500 in 323 firms.

Temporary agency employment has seen high growth since 1990. Employment increased from 16,800 to 37,500. The size of temporary employment firms has increased much faster than the number of firms. These firms are highly concentrated and are primarily located in downtown Seattle and Bellevue.

These employment patterns and locations provide an insight into the many different pressures on the I-405 corridor to provide the means of movement of goods and people.

1.3.4 I-405 Study Area Land Use Trends and Growth

Summary of Population and Housing Trends in the I-405 Study Area

The I-405 area experienced substantial growth in the 1980s as shown in Figure 1.3-1. The projections for the I-405 study area in population growth, assuming an annual growth rate in the range of 1.4 to 2.0 percent, increase from 687,300 in 2000 to 1,010,500 in 2020 and 1,116,300 by 2030.

The household growth in the study area is expected to continue with a greater proportion living in multi-family units in the urban centers. Assuming an annual growth rate in the range of 0.5 percent to 1.2 percent, the households would increase from 265,200 in 2000 to 369,300 in 2020 and 390,500 by 2030. On a broader eastside view, PSRC forecasts indicate a growth rate in 2000 at 1.7 percent and dropping to 0.7 percent in 2030 for single-family households. The growth rate for multi-family units is forecast to range from 3.6 percent in 2000 to 0.7 percent in 2020, rising back up to 1.7 percent by 2030.

As discussed previously, the I-405 corridor has transitioned from a rural/suburban community into an urban area, focusing the continued growth into the urban centers of Bellevue, Redmond, Tukwila, Kirkland, and Renton. At the same time, the transportation infrastructure of I-405, SR 520, I-90, and the associated east/west major arterials are at capacity during peak hours.

The land use pattern in the I-405 corridor has followed the regional patterns, with focused employment centers and low-density suburban expansion outside of the downtown cores of Bellevue, Redmond, and Kirkland. Large residential subdivisions served by major arterials have experienced growth, with a parallel growth in the downtown cores of the eastside cities.

Summary of Employment in the I-405 Study Area

The I-405 study area, in comparison to the Puget Sound region (Figure 1.3-2), has grown at a greater pace in employment in the 1990s (Figure 1.3-1), and estimates project continued growth in the employment base. Projections, assuming an annual growth rate in the range of 0.8 to 1.5 percent, show employment rising from 462,300 in 2000 to 653,000 in 2020 and 708,400 by 2030.

The land use pattern on the Eastside is dependent upon the automobile. The potential for reducing single occupant vehicle trips and congestion is addressed in *Destination 2030* and the I-405 Corridor Program by continuing to develop HOV modes. Strategies include HOV priority lanes, high-capacity transit improvements (increased bus service and light rail), expanded commute trip reduction programs, and transportation demand management programs.

1.3.5 Results of DRAM/EMPAL Modeling for Region and Study Area

The PSRC land use forecasting model (DRAM/EMPAL) covers the four-county central Puget Sound region of Snohomish, King, Pierce, and Kitsap counties. This forecasting model is used by the PSRC to develop and update the MTP, including *Destination 2030*. State law requires the transportation elements of local comprehensive plans to be certified as consistent with the MTP. See the *I-405 Corridor Program Draft Land Use Expertise Report* (DEA, 2001b) for a more detailed discussion of the assumptions in the modeling process.

Based on the above trends, it was important in analyzing cumulative effects to view the population, employment, and households within the context of the regional plans, and therefore the PSRC model was utilized on small geographic areas known as forecast analysis zones (FAZ). The model projected employment and household growth within the FAZ geographical areas over the next 20 years. The projected growth of employment and households is based on the share of the state's population growth allocated to each county within the study area by the State Office of Financial Management (OFM) as required by the Growth Management Act (GMA). Each county and its cities are mandated by GMA to work collaboratively to plan for the coordinated accommodation of this projected growth in their respective comprehensive plans and ensuing implementation actions. Evaluating the I-405 Corridor Program alternatives necessitated adding the proposed transportation improvements (for example, miles of additional I-405 freeway general-purpose lanes) to the DRAM/EMPAL model in the form of increased access and mobility. In addition, King County, Snohomish County, and the PSRC were consulted in order to gain an understanding of issues related to projected growth and planned land use changes.

The results of the modeling were used to identify the cumulative effects, if any, on pressure for growth and development within the forecast analysis zones. Changes in mobility and accessibility within the study area could influence the locational preferences of individuals, businesses, and households. The sum of these individual preferences regarding where people live and work translate into changes in pressure for growth and assumed development activities, as regulated by local land use plans and zoning. These potential development activities are the cumulative effects from the I-405 Corridor Program combined with other regional corridor programs. When the action alternatives are compared to the No Action Alternative, there is a nominal range of decreases and increases in pressure for growth and development. This is assumed to be influenced by variations in the way each alternative enhances access to different portions of the I-405 corridor.

Destination 2030 includes many of the I-405 Corridor Program, SR 520, I-90, and SR 522 improvements. The cumulative effects of these transportation improvements on land use could be positive, with growth in population, employment, and households locating in the urban centers and in-fill development along the I-405 corridor.

The No Action Alternative does show a 24 percent increase in the projected growth from 2000 to 2020, but that is still within the range of projected growth for the region and the area, as defined by PSRC modeling. The No Action Alternative is an existing element within the PSRC model, as it includes existing and committed transportation projects.

The I-405 Corridor Program alternatives are compatible with existing regional and local land use plans, which already address growth.

It is important to remember that the No Action Alternative includes the committed projects that are likely to be built in the near future, and therefore are used for comparison purposes. The DRAM/EMPAL model forecasts the change of the No Action Alternative from 2000 to 2020, and the action alternatives are compared to the No Action Alternative at 2020.

No Action Alternative

The No Action Alternative could influence potential limited, localized effects in the form of increased pressure for growth in households outside of the Urban Growth Area. Figure 1.3-3 shows the future land use in the study area and Figures 1.3-4 and 1.3-5, based on the PSRC model, show the projected growth of employment and households that are forecast to take place by 2020 under the No Action Alternative. The No Action Alternative includes growth throughout the four-county region.

Table 1.3-1 lists areas of increase in employment and households in the central Puget Sound region. The employment growth within the study area is expected to occur along the I-405 corridor and throughout Seattle, the Sammamish Plateau, Kent Valley, Pierce County, North Bend, and Snoqualmie. Some household growth would occur outside of the UGA in south Snohomish County, east King County, northwest Pierce County, and Kitsap County.

Table 1.3-1: No Action Alternative Areas of Increase in Employment and Households

Regional Jurisdictions	Local Jurisdiction with Employment Growth over 3000 Employees in 2020	Local Jurisdiction with Household Growth over 3000 units in 2020
Snohomish County	Everett and Lynnwood	Lynnwood, Mill Creek, Mukilteo
King County	Kirkland, Redmond, Bellevue, Issaquah, Newcastle, Renton, Tukwila, SeaTac, Kent, Auburn, and Federal Way	Woodinville, Redmond, Bothell, Carnation, Bellevue, Issaquah, Tukwila, SeaTac, Kent, Auburn, Covington, Federal Way
Pierce County	Algona, Pacific, Tacoma, Lakewood	Puyallup, Algona, Pacific, Bonney Lake, Sumner, Lakewood

Despite pressure for additional growth outside of the UGA, substantial growth (Figures 1.3-4 and 1.3-5) still would occur within designated urban centers. The designated urban centers that are expected to receive the highest level of employment growth are Everett, Lynnwood, Redmond, Bellevue, Tukwila/South Center, Kent, SeaTac, Auburn, and Federal Way.

The designated urban centers that would receive the highest level of household growth are Lynnwood, Redmond, Bellevue, Tukwila/South Center, SeaTac, Kent, Federal Way, and Puyallup.

Table 1.3-2 shows current and projected employment and households in 2020 for the counties and study area. It is important to note that the 2020 regional growth projections for the No Action Alternative are nearly the same (within 2 percent) as those for the action alternatives, indicating that there is very little change in overall pressure for growth and development among the alternatives.

Another cumulative effect of the No Action Alternative is the effect on land use and transportation concurrency. The local jurisdictions in the I-405 study area are facing serious traffic concurrency problems. If those issues are not managed effectively and addressed adequately by 2020, it is possible that the planned growth might not be able to be accommodated by local jurisdictions. The existing concurrency problems in most of the local jurisdictions would be exacerbated in the future under the No Action Alternative.

Table 1.3-2: No Action Alternative Changes in Employment and Households

Location	Employment				Households			
	2000	2020	Change	Percent Change	2000	2020	Change	Percent Change
	(a)	(b)	(b)-(a)	2000-2020	(a)	(b)	(b)-(a)	2000-2020
King County	1,180,564	1,474,469	293,905	24.9	741,167	967,180	226,013	30.5
Kitsap County	90,962	120,954	29,992	33.0	96,257	137,421	41,164	42.8
Pierce County	294,393	365,085	70,692	24.0	272,835	348,078	75,243	27.6
Snohomish Co.	233,289	300,568	67,279	28.8	227,522	334,335	106,813	46.9
Regional Total	1,799,208	2,261,076	461,868	25.7	1,337,781	1,787,014	449,233	33.6
Study Area	**447,936**	**576,335**	**128,399**	**28.7**	**270,037**	**360,603**	**90,566**	**33.5**

The average traffic level of service was calculated for jurisdictions within the I-405 study area. The results show virtually every jurisdiction within the study area would reach or exceed currently adopted concurrency levels by 2020, including:

- Tukwila (Southcenter area)
- Renton (most areas)
- Newcastle (western portion)
- Bellevue (downtown, Factoria, Bel-Red)
- Mercer Island
- Kirkland (most areas)
- Redmond (western portions, including Overlake)
- Bothell (Snohomish County portion)
- Mill Creek (most areas)
- Lynnwood (most areas)

If concurrency cannot be achieved, growth would be expected to disperse elsewhere within or outside of the study area where it can be permitted.

Legend: Existing Land Use

Land Use
- Forest
- Open Space
- Agriculture
- Commercial
- Industrial
- Residential
- Government
- Right of way
- Mixed

- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

1 0 1 2 3 Miles

Mill Creek
Lynnwood
Edmonds
Woodway
Mountlake Terrace
Brier
Bothell
Kenmore
Shoreline
Lake Forest Park
Simonds Rd NE
Woodinville
Duvall
NE 128th St
Kirkland
Redmond
Lake Washington
Union Bay
Lake Union
Hunts Point
Clyde Hill
Medina
NE 8th St
Bellevue
Redmond Fall City Rd
Lake Sammamish
Seattle
Beaux Arts
Mercer Island
148th Ave SE
Sammamish
Duwamish River
Coal Creek Pky SE
Newcastle
Issaquah
Tukwila
SE 128th St
Renton
Burien
Normandy Park
SeaTac
SE Petrovitsky Rd
68th Ave
132nd Ave SE
Kent
Des Moines
Maple Valley
Covington
Auburn
Federal Way

Existing Land Use within the Study Area

Figure No. 1.3-3

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Legend: Cumulative Effects of the No Action Alternative (Change in Employment from 2000 to 2020)

Employment Change in FAZ
- < 500
- 500 - 999
- 1000 - 1999
- 2000 - 2999
- 3000 - 3999
- > 3999
- Urban Growth Area

- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

4 0 4 8 Miles

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Cumulative Effects of the No Action Alternative (Change in Employment from 2000 to 2020)

Figure No. 1.3-4

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Legend: Cumulative Effects of the No Action Alternative (Change in Households from 2000 to 2020)

Household Change in FAZ
- < 500
- 500 - 999
- 1000 - 1999
- 2000 - 2999
- 3000 - 3999
- > 3999

Study Area Boundary

County Boundaries

Highways

Roadways

Railways

Urban Growth Area

N

3 0 3 6 Miles

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Cumulative Effects of the No Action Alternative (Change in Households from 2000 to 2020)

Figure No. 1.3-5

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This could exacerbate pressure for growth in rural areas outside the UGA or premature growth at the urban fringe of the UGA. If allowed to occur by local land use agencies, this pattern of growth would have potential cumulative effects such as increased demand on the transportation infrastructure, demand on public services, adverse impacts on the environment, vehicular congestion, and long-term increases in the cost of providing public services.

Alternative 1: HCT/TDM Emphasis

Compared to the No Action Alternative, under Alternative 1 the I-405 corridor could experience a slightly greater concentration of employment within the study area and a greater number of households within the designated urban centers and around the HCT stations within the corridor. See Table 1.3-3.

Table 1.3-3: Alternative 1 Changes in Employment and Housing from the No Action Alternative

	2020 Employment				2020 Households			
Location	No Action Alternative (a)	Alternative 1 (b)	Change (b) – (a)	Percent Change From No Action Alternative	No Action Alternative (a)	Alternative 1 (b)	Change (b) – (a)	Percent Change From No Action Alternative
King County	1,474,469	1,471,969	-2,500	-0.2	967,180	965,682	-1,498	-0.2
Kitsap County	120,954	120,921	-33	0.0	137,421	137,543	-122	0.1
Pierce County	365,085	364,995	-90	0.0	348,078	348,063	-15	0.0
Snohomish Co.	300,568	303,204	2,636	0.9	334,335	335,855	1,520	0.5
Regional Total	2,261,076	2,261,089	13	0.0	1,787,014	1,787,143	129	0.0
Study Area	**576,335**	**575,882**	**-453**	**-0.1**	**360,603**	**360,573**	**-30**	**0.0**

Figure 1.3-6 shows projected employment under Alternative 1. Employment growth could result along the I-405 and SR 167 corridors where new fixed-guideway HCT and TDM strategies would be implemented.

Figure 1.3-7 shows projected households under Alternative 1. On a sub-regional level, Alternative 1 could influence pressure on the Eastgate, Factoria, Kent, Kirkland, Lynnwood, and Redmond areas to allow additional employment and housing. The household growth could take place around the urban centers with an improved range of multi-modal transportation choices to regional employment centers, coupled with the future station area planning and implementation of Sound Transit's Sound Move program. This trend would likely emerge as regional and local plans and implementation programs support transit-supportive land uses.

However, since Alternative 1 would not reduce the levels of traffic congestion in much of the study area, compared to the No Action Alternative, it would not be effective in addressing the concurrency problems at the local level. The increased pressure for employment and population growth described above would need to be matched with local actions to maintain adequate transportation levels of service. Without effective transportation improvements, projected growth might not be realized as planned and development could disperse to less suitable areas outside the urban centers and UGA.

Alternative 2: Transit Emphasis

Compared to the No Action Alternative, pressure for growth in employment would be expected to increase in the I-405 corridor and decrease for Seattle, Pierce County, and, to a lesser degree, Kitsap County. Figure 1.3-8 shows the projected employment pattern in the region under Alternative 2. The future employment is forecast to increase in the northeastern and southern portions of the I-405 corridor, specifically in Redmond, the Duvall UGA, and the Kent Valley. See Table 1.3-4.

Table 1.3-4: Alternative 2 Changes in Employment and Housing from the No Action Alternative

	2020 Employment				2020 Households			
Location	No Action Alternative (a)	Alternative 2 (b)	Change (b) – (a)	Percent Change From No Action Alternative	No Action Alternative (a)	Alternative 2 (b)	Change (b) – (a)	Percent Change From No Action Alternative
King County	1,474,469	1,473,785	-684	0.0	967,180	966,821	-359	0.0
Kitsap County	120,954	120,068	-886	-0.7	137,421	135,956	-1,465	-1.1
Pierce County	365,085	363,894	-1,191	-0.3	348,078	347,789	-289	-0.1
Snohomish Co.	300,568	303,343	2,775	0.9	334,335	336,574	2,239	0.7
Regional Total	2,261,076	2,261,090	14	0.0	1,787,014	1,787,140	126	0.0
Study Area	**576,335**	**579,866**	**3,351**	**0.6**	**360,603**	**364,554**	**3,951**	**1.1**

The overall pattern of change in households under Alternative 2 would be similar to that in Alternative 1, although additional pressure for household growth may occur in the Mill Creek, Lynnwood, and Bothell areas in the north, and in Federal Way and Kent to the south. Figure 1.3-9 shows the projected pattern of households under Alternative 2. It is projected that the number of households would increase in south Snohomish County, Redmond, Kirkland, Kent, Auburn, and Federal Way. It is expected that the urban centers (Canyon Park, Lynnwood, SeaTac, Kent, and Federal Way) would absorb much of the growth.

In Alternative 2, the urban centers and future HCT stations would likely become stronger focal points for growth in employment and households in support of the land use strategies of the region, and in relation to transit-oriented development (TOD). TOD would be likely in the urban centers and in the corridor between the centers regardless of the timing of light rail, as it is regional policy and an economic tool for local jurisdictions.

The overall effects under Alternative 2 would be similar to Alternative 1, except that Alternative 2 would add capacity to I-405 and provide some reduction in study area traffic congestion. This would better allow local jurisdictions to meet concurrency requirements in a manner that would facilitate the clustering of growth and development within urban centers and the UGA. Alternative 2 would conform to local plans to help reduce the spillover or continued pattern of growth outside of the UGA; however, the increased pressure for employment and population growth would still need to be matched with local actions to maintain adequate transportation levels of service. Without effective transportation improvements, projected growth might not be realized as planned and development could disperse to less suitable areas outside the urban centers and UGA.

Legend: Cumulative Effects (Change in Employment for Alt. 1 @ 2020 from the No Action Alt. @ 2020)

Employment Change in FAZ

- < 249
- -249 to -51
- -50 to 50
- 51 to 249
- 250 to 499
- > 500

- Urban Growth Area
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

2 0 2 4 6 Miles

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Cumulative Effects (Change in Employment for Alt. 1 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-6

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Legend: Cumulative Effects (Change in Households for Alt. 1 @ 2020 from the No Action Alt. @ 2020)

Household Change in FAZ

- < -249
- -249 to -51
- -50 to 50
- 51 to 249
- 250 to 499
- > 500

Urban Growth Area

Study Area Boundary

County Boundaries

Highways

Roadways

Railways

N

2 0 2 4 Miles

SNOHOMISH

KING

Lake Washington

Lake Sammamish

Cumulative Effects (Change in Households for Alt. 1 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-7

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Legend: Cumulative Effects (Change in Employment for Alt. 2 @ 2020 from the No Action Alt. @ 2020)

Employment Change in FAZ

- < 249
- -249 to -51
- -50 to 50
- 51 to 249
- 250 to 499
- > 500

- Urban Growth Area
- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

2 0 2 4 6 Miles

SNOHOMISH

KING

Cumulative Effects (Change in Employment for Alt. 2 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-8

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Legend: Cumulative Effects (Change in Households for Alt. 2 @ 2020 from the No Action Alt. @ 2020)

Household Change in FAZ

- < -249
- -249 to -51
- -50 to 50
- 51 to 249
- 250 to 499
- > 500

Urban Growth Area

Study Area Boundary

County Boundaries

Highways

Roadways

Railways

N

3 0 3 6 Miles

SNOHOMISH

KING

Lake Washington

Lake Sammamish

Cumulative Effects (Change in Households for Alt. 2 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-9

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Alternative 3: Mixed Mode Emphasis

Compared to the No Action Alternative, pressure for employment and housing growth would be expected to increase in the study area and UGA in Alternative 3. This would support planned development in designated urban centers and around the HCT stations. Alternative 3, as shown in Table 1.3-5, would have effects similar to Alternative 2, but with increased pressure for employment and households within the corridor. From a regional perspective, the added capacity on I-405, the BRT system, increased reliance on HOV projects, arterial improvements, and implementation of TDM strategies would create improved accessibility to those portions of the I-405 corridor already planned for higher urban densities.

Table 1.3-5: Alternative 3 Changes in Employment and Housing from the No Action Alternative

	2020 Employment				2020 Households			
Location	No Action Alternative (a)	Alternative 3 (b)	Change (b) – (a)	Percentage Change From No Action Alternative	No Action Alternative (a)	Alternative 3 (b)	Change (b) – (a)	Percent Change From No Action Alternative
King County	1,474,469	1,474,905	436	0.0	967,180	967,883	703	0.1
Kitsap County	120,954	119,289	1,665	-1.4	137,421	134,539	2,882	-2.1
Pierce County	365,085	363,257	1,828	-0.5	348,078	346,729	1,349	-0.4
Snohomish Co.	300,568	303,650	3,082	1.0	334,335	338,008	3,673	1.1
Regional Total	2,261,076	2,261,101	25	0.0	1,787,014	1,787,159	145	0.0
Study Area	**576,335**	**582,455**	**6,120**	**1.1**	**360,603**	**367,600**	**6,997**	**1.9**

Figures 1.3-10 and 1.3-11 show the differences in the projected pattern of employment and households under Alternative 3. The projected pressure for growth would be similar to Alternative 2, but with greater forecast employment and households in the northern and southern portions of the I-405 corridor.

Alternative 3 is similar to Alternative 2 in that the urban centers and the transit stations would become stronger focal points for growth in employment and households. There are two areas within the study area (Kirkland/Redmond and Newcastle/Renton/Kent) that would be expected to experience greater pressure for growth in employment and households as seen under Alternative 3 (Figures 1.3-10 and 1.3-11). Alternative 3 could enhance planned growth within key portions of the UGA planned for higher density development. This alternative supports regional policies seeking to create connectivity, density, and transit-oriented development to reduce growth impacts outside the UGA. The growth pattern associated with Alternative 3, when compared to the No Action Alternative, suggests that it may result in lessening of growth pressures on lands outside the UGA.

Alternative 3 provides for the greatest implementation of projects that are supportive of *Destination 2030* policies and locally adopted comprehensive plans. All of these regional and local policies call for the improvement of the regional transportation infrastructure and reduction in traffic congestion. The capacity expansions on I-405 included in Alternative 3 would shift some traffic onto I-405 from the arterials and provide reduction in study area traffic congestion. Thus, this alternative would provide the best opportunity for local agencies to meet

concurrency standards, implement clustering of development, and increase density within the urban centers and the UGA with a transportation system that serves as required under the Growth Management Act.

Alternative 4: Roadway Capacity Emphasis

Under Alternative 4, as shown in Table 1.3-6, pressure for employment and housing would be expected to increase in the I-405 corridor as compared to the No Action Alternative. Figure 1.3-12 shows the projected employment pattern in the region under Alternative 4. Additional pressure for employment in the Woodinville, Kirkland, and Renton/Kent Valley area would be expected partially due to increased accessibility. Alternative 4 is forecast to result in less employment outside of the UGA compared to the No Action Alternative condition.

Table 1.3-6: Alternative 4 Changes in Employment and Housing from the No Action Alternative

	2020 Employment				2020 Households			
Location	No Action Alternative (a)	Alternative 4 (b)	Change (b) – (a)	Percent Change From No Action Alternative	No Action Alternative (a)	Alternative 4 (b)	Change (b) – (a)	Percent Change From No Action Alternative
King County	1,474,469	1,474,966	497	0.0	967,180	966,953	227	0.0
Kitsap County	120,954	119,076	1,878	-1.6	137,421	134,410	3,011	-2.2
Pierce County	365,085	362,941	2,144	-0.6	348,078	346,376	1,702	-0.5
Snohomish Co.	300,568	304,111	3,543	1.2	334,335	339,399	5,064	1.5
Regional Total	2,261,076	2,261,094	18	0.0	1,787,014	1,787,138	124	0.0
Study Area	**576,335**	**583,044**	**6,709**	**1.2**	**360,603**	**368,218**	**7,615**	**2.1**

Figure 1.3-13 shows the projected household pattern in the region. The number of households is forecast to increase within the UGA compared to the No Action Alternative, but there also could be more growth at the outer edges of the UGA.

The forecast growth pattern under Alternative 4, when compared to the No Action Alternative, suggests a different trend for pressure to occur outside of the UGA, which also could result in increased growth pressure on the fringe areas of the UGA not currently planned for higher urban densities. This would be considered a negative impact on land use outside of the UGA and is not supported by *Destination 2030* or the CWPP.

Alternative 4 would perform similar to Alternative 3 with regard to addressing the long-term concurrency problems facing local jurisdictions. The capacity expansions on I-405 included in Alternative 4 would shift traffic onto I-405 from the arterials and reduce study area traffic congestion. This would improve opportunities relative to Alternatives 1 and 2 for clustering of development and increasing density within the urban centers and the UGA without triggering limitations under concurrency ordinances.

Legend: Cumulative Effects (Change in Employment for Alt. 3 @ 2020 from the No Action Alt. @ 2020)

Employment Change in FAZ

- < 249
- -249 to -51
- -50 to 50
- 51 to 249
- 250 to 499
- > 500
- Urban Growth Area

- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

2 0 2 4 6 Miles

SNOHOMISH

KING

Lake Washington

Lake Sammamish

Cumulative Effects (Change in Employment for Alt. 3 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-10

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Legend: Cumulative Effects (Change in Households for Alt. 3 @ 2020 from the No Action Alt. @ 2020)

Household Change in FAZ

- < -249
- -249 to -51
- -50 to 50
- 51 to 249
- 250 to 499
- > 500

Urban Growth Area

Study Area Boundary

County Boundaries

Highways

Roadways

Railways

N

2 0 2 4 6 Miles

SNOHOMISH

KING

Lake Washington

Lake Sammamish

Cumulative Effects (Change in Houseolds for Alt. 3 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-11

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Legend: Cumulative Effects (Change in Employment for Alt. 4 @ 2020 from the No Action Alt. @ 2020)

Employment Change in FAZ

- < 249
- -249 to -51
- -50 to 50
- 51 to 249
- 250 to 499
- > 500
- Urban Growth Area

- Study Area Boundary
- County Boundaries
- Highways
- Roadways
- Railways

N

2 0 2 4 6 Miles

SNOHOMISH

KING

Cumulative Effects (Change in Employment for Alt. 4 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-12

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Legend: Cumulative Effects (Change in Households for Alt. 4 @ 2020 from the No Action Alt. @ 2020)

Household Change in FAZ

- < -249
- -249 to -51
- -50 to 50
- 51 to 249
- 250 to 499
- > 500

Urban Growth Area

Study Area Boundary

County Boundaries

Highways

Roadways

Railways

N

2 0 2 4 6 Miles

SNOHOMISH

KING

Lake Washington

Lake Sammamish

Cumulative Effects (Change in Households for Alt. 4 @ 2020 from the No Action Alt. @ 2020)

Figure No. 1.3-13

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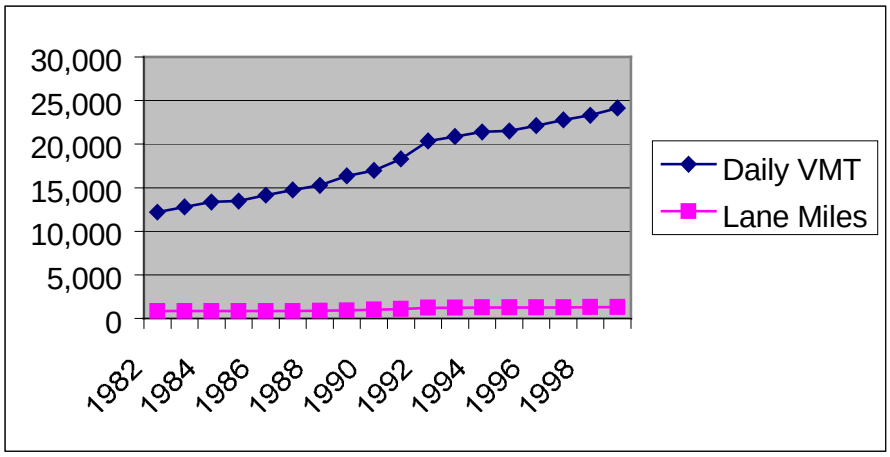
1.3.6 Traffic and Transportation

Roadway Network

The I-405 corridor is one of many transportation corridors within the regional network of roadways connecting communities throughout the Puget Sound. The four-county region has more than 11,400 lane miles. The I-405 corridor study area has about 13 percent of the region's roadways. Because of the relatively sparse roadway network in the I-405 study area (about 1,500 lane-miles in the 250-square-mile area), there is greater reliance on state highways to serve non-regional trips than would normally be the case. Interstate 405 is the transportation backbone of the study area, and travel demand within the study area is heaviest on I-405 itself.

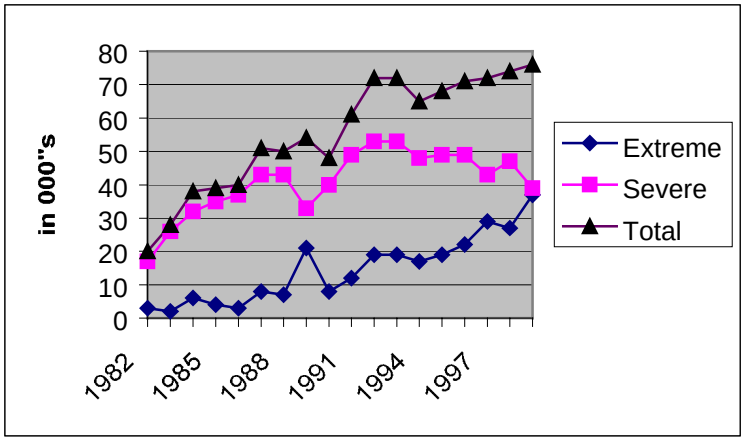
Figure 1.3-14 shows the growth of freeway lane miles and daily VMT in the region over the past 20 years. Figure 1.3-15 shows the result, increasing percentage of lanes with peak period congestion. Extreme congestion continues to increase each year, as the freeways have become more crowded during the peak hours.

Figure 1.3-14: Growth in Freeway Region-wide Daily VMT (000's) and Freeway Lane Miles 1982-2000



Source: Texas Institute Mobility Data for Seattle-Everett, 2001 Urban Mobility Study

Figure 1.3-15: Percent of Peak Period Travel in Severe or Extreme Congestion (1982-2000)



Source: Texas Institute Mobility Data for Seattle-Everett, 2001 Urban Mobility Study

Traffic Volumes and Travel Demand

In evaluating the regional cumulative effects of the I-405 Corridor Program, the forecasts for population, employment, and travel demand in the corridor were compared to forecasts for the four-county central Puget Sound region. Several observations were made. As the Eastside has grown, traffic volumes have increased dramatically. From 1970 to 1999, the average daily traffic on I-405 north of I-90 increased nearly five-fold, growing from 41,000 to 198,000 cars per day. The roadway network has not expanded at the same rate, resulting in increased congestion on all the roads, especially on the I-405 freeway.

While the entire corridor experienced almost a 400 percent increase in traffic volumes from 1970-1999, various sections of I-405 show different rates of traffic growth. From 1980 to 2000, the increase in the corridor was 150 percent, as capacity was reached on several sections of I-405. Table 1.3-7 presents a historical summary of the average annual daily traffic on selected arterials and state roads in the I-405 Corridor Program study area.

Table 1.3-7: Average Annual Daily Traffic on Selected Arterial and State Roads in I-405 Study Area (1965 to 1999)

Measurement Location	1965	1970	1975	1980	1985	1990	1995 baseline	1999
I-405 north of I-90	24,400a	41,000a	53,400a	80,100a	115,400a	137,600c	164,832	198,000c
I-405 north of SR 520	12,100a	33,400a	48,400a	76,400a	107,400a	146,800c	152,174	178,000c
I-405 north of SR 522	N/A	15,000a	20,300a	37,200a	52,700a	88,400c	92,822	94,000c
I-405 south of I-90	24,000	N/A	N/A	76,000c	115,400c	129000	116,525	168,000c
SR 522 west of I-405	N/A	N/A	N/A	21,500c	24,800c	30000	32,000c	38,000c
SR 908 east of I-405 (Rose Hill)	N/A	N/A	N/A	24,800c	28,300c	30000	31,000c	46,300d
148th Ave SE north I-90	N/A	15,000a	18,400a	22,600a	30,200a	N/A	N/A	39,700e
Lake Wa Blvd north of SR 520	2,200a	11,800a	11,700a	23,000a	27,500a	N/A	N/A	N/A
I-90 Mercer Island Bridge	17,900 b 42,892a	48,352a	48,655a	52,283a	68,500a	112,400c	128,000c	121,000c
SR 520 Lake Wash. Bridge	22,998a	37,744a	47,544a	72,130a	99,500a	97,700c	100,000c	110,000c

a Eastside Transportation Program, Background Report, October 1988, p. 4.
b Number of vehicles in 1961, Puget Sound Regional Transportation Study
c WSDOT Annual Traffic Report, 1983, 1985, 1991, 1994, 1996
d City of Kirkland, 1999 traffic counts
e City of Bellevue , 2000 traffic counts

The forecasts for VMT and VHT in the study area are expected to follow the region's forecasted trend of a greater than 50 percent increase between 1999 and 2020. Table 1.3-8 presents the historical growth in VMT and VHT for the I-405 study area from 1980 to 2000, including the 2020 No Action Alternative, and the growth for the four-county region during the same time period.

Table 1.3-8: VMT and VHT for Study Area and Region

	VMT (Daily)		VHT (Daily)	
Alternative	Study Area (trips within)	Region-wide	Study Area (trips within)	Region-wide
1980	9,322,000	39,500,000	359,800	1,411,000
1990	14,962,400	63,400,000	529,100	2,075,000
1995	16,346,000	69,412,000	586,000	2,295,000
2020 No Action Alternative	22,510,000	100,571,000	1,156,000	3,948,000
Change vs. 1995 (%)	37.7%	44.9%	97.3%	72.0%
Alternative 1	22,563,000	100,497,000	1,155,000	3,941,000
Change vs. No Action Alternative (%) Change vs. 1995	0.2% 38.0%	-0.1% 44.7%	-0.1% 97.2%	-0.2% 71.7%
Alternative 2	24,215,000	101,560,000	1,164,000	3,922,000
Change vs. No Action Alternative (%) Change vs. 1995	7.6% 48.1%	1.0% 46.3%	0.7% 98.6%	–0.7% 70.9%
Alternative 3	25,346,000	102,263,000	1,170,000	3,907,000
Change vs. No Action Alternative (%) Change vs. 1995	12.6% 55.0%	1.7% 47.3%	1.2% 99.7%	-1.0% 70.2%
Alternative 4	26,208,000	102,730,000	1,184,000	3,903,000
Change vs. No Action Alternative (%) Change vs. 1995	16.4% 60.3%	2.1% 48.9%	2.4% 102.0%	-1.14% 70.1%

Source: PSRC Model

Without accounting for the potential effects of TDM, VMT in the study area is expected to increase under each alternative. Alternatives 3 and 4 show the largest increases in the study area VMT (13 percent and 16 percent, respectively). Regional VMT increases by 1 to 2 percent for Alternatives 2 through 4, while Alternative 1 reduces regional VMT slightly. When the TDM program is included in the action alternatives, study area VMT could be reduced for each of the action alternatives by 5 percent or more.

Study area VHT decreases slightly with Alternative 1 (not including TDM effects). Alternatives 2, 3, and 4 result in increases in VHT because of the additional travel within the corridor. However, regional VHT decreases with each alternative, up to slightly more than 1 percent under Alternative 4. The effects are most pronounced during the PM peak period. The TDM program could further reduce study area VHT for each of the action alternatives.

Trips in the study area are forecasted to increase by 50 percent between 1999 and 2020, similar to the regional increase. For the year 2020, the trip pattern percentages in the region are expected to be similar to those currently in the region. In the I-405 Corridor Program study area, the relative shares of each trip purpose are expected to be similar in 2020 to those currently in the corridor. Trip distribution, i.e., where trips are going to and coming from in relation to the study area, are also forecasted to change very little by year 2020 in the I-405 corridor. More than 55 percent of daily trips begin and end within the study area, with the remaining 45 percent of trips beginning or ending outside the study area. Over 70 percent of the total daily person-trips are less than 10 miles within the study area; less than 10 percent of the trips are over 30 miles in length. These trip patterns are expected to continue in the corridor in the year 2020, although there could be a slightly higher percentage of trips averaging over 30 miles in length.

Performance of I-405 Corridor Program Improvements in the Region

As previously discussed, the I-405 Corridor Program study area includes 21 percent of the regional population, and produces about 24 percent of the region's trips. This percentage has held relatively constant for the past 30 years and is forecasted to continue for the next 30 years given the current plans and policies in the region. As part of the second level screening for the four action alternatives, the travel demand model was used to examine the effects of improvements by forecasting performance measures such as transit ridership, highway congestion, traffic volumes, and mode share shifts on I-405 and the study area. The transportation performance measures for the region in *Destination 2030* include the cumulative effects of the more prominent transportation improvements proposed in the I-405 Corridor Program, as noted above. Table 1.3-9 provides a comparison of performance measures.

Table 1.3-9: Performance Measures for Destination 2030 (Regional) and I-405 Study Area

	Destination 2030 (MTP)	1995 Baseline	2020 No Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4
VMT (daily total) Region-wide	93,562,322						
VMT (daily total) Study area		16,346,000	22,510,000	22,563,000	24,215,000	25,346,000	26,208,000
VHT (daily) Region-wide	3,226,300						
VHT (daily) Study area		586,000	1,156,000	1,155,000	1,164,000	1,170,000	1,184,000
Mode Share - all trips (weekday)							
SOV	55%	99%	96.00%	96.00%	96.00%	96.00%	96.00%
2+ Carpool	39%	Included above	Included above	Included above	Included above	Included above	Included above
3+ Carpool		1%	2%	2%	2%	2%	2%
Transit	5%	1%	2%	2%	2%	3%	2%
Mode Share - commute							
SOV	56%	95%	84%	83%	83%	83%	83%
2+ Carpool	32%	Included above	Included above	Included above	Included above	Included above	Included above
3+ Carpool	Included above	2%	9%	9%	9%	9%	9%
Transit	12%	3%	7%	8%	8%	8%	8%
Average Speeds in MPH							
AM Peak	35	30	26	26	27	28	29
PM Peak	32	24	13	13	13	14	14
Daily	34	28	19	20	21	22	22

Source: Destination 2030 (MTP):

Destination 2030 adopted May 24, 2001 (Metropolitan Transportation Plan for the Central Puget Sound Region); Technical Appendix 8: Destination 2030 System Performance.
For all other columns including - the 1995 Baseline, 2020 No Action Alternative, and the four Alternatives -- the source is the *I-405 Corridor Program Draft Transportation Expertise Report* (Mirai and DEA, 2001), February 2001.

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